THE IRON TRADE REVIEW

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Unusual Activity of Market for Holiday Period

Buyers Glad to Pay Premiums if They Can Get Prompt Shipment—Some Price Advances Expected Early in the New Year

Seldom in the history of the iron trade have the holidays interfered as little as they have up to the present time this year with business activity. The cheerfulness with which buyers of finished materials pay premiums for prompt delivery is perhaps the most striking feature of the market. Mills in eastern Pennsylvania are able to charge from 1.60c to 1.65c at their plants for plates and 1.70c to 1.75c for shapes and ship them hundreds of miles, passing many mills of the central west which are unable to make deliveries until far into next year. One large independent company came into the market last week to sell for delivery during the last half of 1913 and in two or three days sold all the tonnage which it had to offer, including 60,000 tons of bars at 1.40c, Pittsburgh. Some other independent companies have added to the tonnage sold for delivery in the last half of 1913, but their policy, as a rule, is very conservative.

Prices

The decline in prices, which began early in 1910 and continued throughout the year 1911, was checked toward the end of that year, and during this year substantial progress toward higher levels has been made. That the market did not move up more rapidly was probably due to the strong conservative influences of leading interests which for a number of weeks have continued to quote at current prices for delivery throughout next year. Some price advances are expected early in the new year, particularly in sheets, on which premiums are now being freely paid for prompt delivery.

Pig Iron

Recent buying of pig iron by cast iron pipe manufacturers in eastern territory has been heavier than was estimated, as it is now known that these purchases have reached about 25,000 tons. A New Jersey pipe maker bought 10,000 tons, and the leading pipe interest has taken several thousand tons for its New Jersey plant. The Norfolk & Western railroad, which had been inquiring for 5,000 tons for its Roanoke shop for last half requirements, has decided not to buy at the present time. It is understood the company was influenced by recent advances in prices, although one or two Virginia makers were willing to take third quarter tonnage at a slight advance over the $15.50 price, at the furnace, asked for second quarter for No. 2X. In some sections, there are increasing indications of interest of buyers in second half requirements and it is probable that there will be a general buying movement for that delivery some time in January. Conditions in southern territory seem to be somewhat unsettled, but a hopeful spirit prevails.

Railroad Buying

Car orders for the year will be about 235,000, compared with 133,000 for the year 1911, and buying shows no indication of decreasing. The Harriman lines are now in the market for 12,000 freight cars, 300 passenger cars and 250 locomotives. New orders include 3,000 for the Illinois Central, awarded to the Bettendorf Axle Co.; 1,500 box cars for the M., K. & T. railroad, taken by the American Car & Foundry Co., and 500 box cars, awarded to the Mt. Vernon Car Mfg. Co. by the Norfolk & Western railroad, which also placed 500 steel stock cars with the Ralston Steel Car Co. The Chicago, Burlington & Quincy is understood to have placed an additional order of 2,000 freight cars with the Haskell & Barker Car Co. Structural material ordered by railroads includes 5,600 tons by the Chicago & Northwestern and 1,200 tons by the Chicago, St. Paul, Minneapolis & Omaha, awarded to the American Bridge Co.

Crude Steel

The scarcity of crude steel is a prominent feature of market conditions. A round lot of open-hearth billets has been sold for delivery in Philadelphia territory and a New Jersey consumer is still negotiating for a block of from 15,000 to 20,000 tons of both Bessemer and open-hearth billets for delivery throughout next year. About 15,000 tons of open-hearth billets have recently been sold to one of the steel companies in the Pittsburgh district at a price which corresponds to $29, Pittsburgh, and it is understood that an equal tonnage is about to be sold to central western and eastern consumers at about the same price.

Iron Ore

Chartering of vessel tonnage for the movement of ore next season has been carried on at a lively rate at an advance of 5 cents per ton, the new rate from the head of the lakes being 45 cents. The attempt of one firm to make contracts at 40 cents was not successful, except as to a small tonnage to be carried by its own boats. Carrying contracts indicate an expectation of a movement of at least 50,000,000 tons next year.

PITTSBURGH

Heavy Car Orders Placed and Pending

Office of THE IRON TRADE REVIEW, 2148-49 Oliver Bldg., Dec. 23.

Conditions in the iron and steel trade are practically the same as they were a week ago. Although there has been a slight falling off in specifying, there is no indication of any future weakness. Some of the mills are selling bars, plates and shapes for third quarter delivery at present prices. It was understood that some manufacturers have accepted contracts through the entire year.

Pig Iron.—The pig iron market is comparatively quiet, although new inquiry is reported for foundry and malleable grades. Foundry is being firmly maintained at $17.50, valley, and small lots have sold 50 cents above this figure. Many in the trade believe that active buying will not be renewed until after Jan. 1. We quote all grades as follows:

(First Quarter.)

Bessemer, valley	$17.25
Bessemer, Pittsburgh	18.15
Basic, valley	16.50
Basic, Pittsburgh	17.40
No. 2 foundry, valley	17.50
No. 2 foundry, Pittsburgh	18.40
Malleable, valley	17.25 to 17.50
Malleable, Pittsburgh	18.15 to 18.40
Gray forge, valley	16.00 to 16.50
Gray forge, Pittsburgh	16.90 to 17.40

Ferro-Alloys.—Agents in this city are now uniformly quoting 80 per cent ferro-manganese at a spread from $65 to $70, seaboard, for forward delivery, but no large contracts have been made for some time. As a general rule, dealers are asking $70 for first half shipment and $65 for second half, although the latter figure is nominal, inasmuch as dealers are inclined to refuse to sell beyond July 1.

Fifty per cent ferro-silicon continues to be quoted at $75, Pittsburgh, for both forward and prompt shipment. No large sales have been made recently.

We quote 80 per cent ferro-manganese at $73 to $75, Baltimore, for prompt delivery and $65 to $70 for forward shipment. The freight rate from Baltimore to Pittsburgh is $1.95 per ton.

Fifty per cent ferro-silicon is quoted at $75, Pittsburgh, for prompt and forward delivery; 12 to 13 per cent, $25 to $26, 11 to 12 per cent, $24 to $25; 10 to 11 per cent, $23 to $24; 9 to 10 per cent, $22 to $23, f. o. b. Globe, Jisco and Ashland furnaces. The freight rate to Pittsburgh is $1.90. The foreign grades are held at $1 or more a ton over domestic prices.

On ferro-titanium we quote 8 cents per pound for carload lots; 10 cents per pound for 2,000 pound lots and over, and 12½ cents per pound in lots up to 2,000 pounds.

Plates.—Demand for prompt plates continues heavy, and mills in a position to make anything like immediate delivery continue to enjoy fancy prices. Some mills report that there is a slight falling off in specifying, while others advise that pressure is just as heavy as it was a fortnight ago. The Missouri, Kansas & Texas railroad has placed an order for 1,500 cars with the American Car & Foundry Co.; the Norfolk & Western has placed 500 cars with the Mt. Vernon Car Mfg. Co., and 500 with the Ralston Steel Car Co., and the Illinois Central has ordered 3,000 cars from the Bettendorf Axle Co., Davenport, Iowa.

It is understood that the Harriman interests are in the market for 12,000 freight, 300 passenger, and 250 locomotives. Car builders have enough orders on their books to assure maximum operation through the first half of the year. Quotations follow:

Standard steel plates ¼ inch thick, 6¼ to 100 inches, 1.45c to 1.60c for forward shipment and 1.65c to 1.90c for prompt shipment, For extras, see card of Sept. 1, 1909.

Sheets.—Manufacturers advise that specifying has not fallen off this month and from present indications this will be one of the largest Decembers in the history of the trade. Unless demand falls off the last 10 days December will exceed the preceding month by a broad margin.

As announced in last week's issue of THE IRON TRADE REVIEW, one of the manufacturers in this district has advanced blue annealed and galvanized products $2 a ton and black sheets $1 a ton for second quarter delivery. The leading interest and several independent manufacturers have continued to offer prevailing quotations through the first half of the year, although it is understood that a number of interests no longer are able to promise delivery until after July 1.

Mills in a position to promise anything like prompt delivery continue to enjoy premium prices. One interest advised this morning that it was receiving $1.85 for No. 10 gage blue annealed, $2.35 for No. 28 gage black, and $3.60 for No. 28 gage galvanized sheets for delivery within the next four or five weeks. The bulk of the tonnage for delivery through the first half of 1913 is being taken at the following prices:

Flat Sheets.

Black Sheets.—Nos. 10-12 gage, $1.90 per 100 pounds; Nos. 13-14 gage, $1.95; Nos. 15-16 gage, $2.00; Nos. 17-21 gage, $2.05; Nos. 22-24 gage, $2.10; Nos. 25-26 gage, $2.15; No. 27 gage, $2.20; No. 28 gage, $2.25; No. 29 gage, $2.30; No. 30 gage, $2.40.

Tin mill sizes, Nos. 15-16 gage, $2.00 per 100 pounds; Nos. 17-21 gage, $2.05; Nos. 22-24 gage, $2.10; Nos. 25-27 gage, $2.15; No. 28 gage, $2.20; Nos. 29-30 gage, $2.25; Nos. 30½-31 gage, $2.30; No. 32 gage, $2.35.

Blue Annealed.—Nos. 3-8, $1.60 per 100 pounds; Nos. 9-10, $1.65; Nos. 11-12, $1.70; Nos. 13-14, $1.75; Nos. 15-16, $1.85.

Galvanized.

Nos. 10-11 gage, $2.40 per 100 pounds; Nos. 12-14 gage, $2.50; Nos. 15-16 gage, $2.65; Nos. 17-21 gage, $2.80; Nos. 22-24 gage, $2.95; Nos. 25-26 gage, $3.10; No. 27 gage, $3.25; No. 28 gage, $3.40; No. 29 gage, $3.55; No. 30 gage, $3.70.

Roofing Sheets

Net extras on all gages per 100 pounds. Corrugated 2-inch, 2½-inch, 3-inch and 5-inch corrugation, 5c; 2 V crimped without sticks, 5c; corrugated 1¼-inch corrugation, 10c; 3 V crimped without sticks, 10c; pressed standing seam with cleats, 15c; plain roll roofing with or without cleats, 15c.

Painted Roofing.

12 to 18 gage, inc., 5c; 19 to 24 gage, inc., 10c; 25 to 28 gage inc., 15c.

Tin Plate.—Specifications against contracts the first three weeks of this month were equally as heavy as those during the corresponding period in November, and it is generally believed that this month will be the heaviest December in the history of the trade, so far as specifying and shipments are concerned. Consumers are specifying from one to two months earlier than is generally customary.

This feature may result in somewhat of a lull the first and second months of the year. Both sheet and tin mills continue to suffer from the scarcity of raw materials. Although the present price is considered low, in view of the relative high price of raw material, none of the mills is quoting above the $3.60 base price so far as can be learned. We quote as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.60, f. o. b. mill, Pittsburgh district.

Rails.—Mills rolling rails in this district advise that there is an unusually heavy demand for light rails and rather heavy tonnages were

booked last week. Despite the fact that light rails are quoted $2 below normal prices, figures have not been changed for two months.

Traction line interests have not yet covered requirements for 1913, although it is understood that estimates are being made.

Manufacturers of spikes continue to offer the 1.90c quotation on desirable tonnages, but the 2c quotation is becoming more and more general. It is understood that the rather heavy tonnage of spikes sold at 2.20c early in the week for rather prompt delivery.

Angle bars continue to be quoted at 1.50c. Track bolts show a tendency toward advanced prices and some makers are refusing to shade the 2.50c quotation, which we carry as the maximum price of this product. Rails are quoted as follows, with the base price of open-hearth steel sections at 1.34c per pound at the mill:

Fifty-pound and heavier, 1.25c per pound; carloads and less than 500 tons, 1.34c per pound; light rails on base weight of 40 to 45 pounds, 1.25c, the schedule on the other weights being irregular and subject to negotiations; angle bars for standard sections, 1.50c, Pittsburgh; track bolts, 2.40c to 2.50c, base, Pittsburgh.

Railroad Spikes.

4½, 5 and 5½ and 9-16	1.90c to 2.00c
3, 3½, 4, 4½ and 5 x ½	.10
3½, 4 and 4½ x 7-16	.20
3, 3½, 4 and 4½ x ⅜	.30
2½ x ⅜	.40
2½, 3 and 3½ x 5-16	.60
2 x 5-16	.80

Billets and Sheet Bars.—In last week's issue, an offer of 30,000 tons of open-hearth standard billets at $29, Pittsburgh, for first quarter delivery, was mentioned. We are now able to report that about half of this tonnage was sold to one of the steel companies in this district at a price which corresponds to $29, Pittsburgh, the highest figure at which billets have been sold this year. Although no official information is given, it is understood that the remainder of this tonnage will go to central western and eastern consumers at about the same price. Despite reports that several steel mills have fixed prices for first quarter semi-finished steel, these announcements appeared to be without foundation.

The scarcity of semi-finished steel and the infrequency of sales, make it practically impossible to offer anything but nominal quotations. A consumer just outside this city advised on Thursday that he would be unable to obtain first quarter sheet bars at less than $30, Pittsburgh. Although quotations offered are more or less nominal, officials in close touch with the semi-finished steel situation advise that they represent the market as accurately as possible under the present rather abnormal conditions.

Bessemer 4 x 4 billets with 0.25 carbon and less are quoted at $27.50, with the usual extra for size and analysis, and open-hearth rolling billets, $28.00. Bessemer sheet and tin bars are quoted at $28.00 and open-hearth sheet bars are quoted $28.50, f. o. b. Pittsburgh and Youngstown, with full freight to destination added. Forging billets are quoted at $34.00, Pittsburgh.

Hoops and Bands.—As announced a week ago, leading manufacturers are refusing to sell steel hoops below 1.60c and as high as 1.75c has been quoted on undesired tonnages. We quote hoops at a range from 1.60c to 1.70c. Bands continued to be quoted at 1.40c to 1.45c. Demand continues fairly heavy and specifying is liberal. We quote:

Hoops in carload lots, 1.60c to 1.70c, Pittsburgh, in less than carload lots, 1.65c to 1.75c; bands, 1.40c to 1.45c, base, with net extras, as per standard steel.

Merchant Bars.—Some of the independent manufacturers of steel bars have opened books for shipment the last half of 1913, although formal announcement of such action has not been made. In fact, one of the companies that opened books a few days ago, already has practically refused to accept further orders. Several of the largest consumers of steel bars advise that they are not particularly anxious to place tonnage for last half delivery, inasmuch as contracts calling for material that far ahead are considered merely as options.

Some of the manufacturers will be unable to deliver tonnages now on the books for first half shipment until the third or fourth quarters of next year. The leading interest has not formally opened books beyond July 1. The 1.40c quotation continues to be maintained.

Iron bar makers are quoting products at a range from 1.70c to 1.80c, and the latter figure represents the price of material for prompt delivery. Manufacturers of cold rolled shafting have not yet advised the trade of any change in price, although rumors of an advance before the end of the year are heard frequently in the trade. Shafting is quoted at 60 per cent off for carload lots and 55 per cent off for less than carload lots. Quotations, which are unchanged, follow:

Common iron bars, 1.70c to 1.80c, Pittsburgh; Bessemer and open-hearth steel bars, 1.40c to 1.45c; plow and cultivator, 1.40c to 1.45c; channels, angles, zees, tees, under 3 inch, 1.50c to 1.55c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds and not less than 1,000 pounds of a size, 0.15 advance, less than 1,000 pounds of a size, 0.35. Cold rolled and ground shafting, 60 per cent off in carloads and 55 per cent in less than carloads delivered in base territory.

Muck Bar.—Consumers of muck bar covered requirements earlier in the year and no sales have been made for some time. We quote muck bar nominally at $32, Pittsburgh.

Bolts, Nuts and Rivets.—Manufacturers are now asking 2.20c and 2.30c for structural and boiler rivets, respectively. None of the makers is able to promise material until next year, some of the interests being from 60 to 90 days deferred on shipments. Advanced nut and bolt discounts announced a week ago, are being firmly maintained. We quote the market as follows:

Rivets

Button head structural rivets, 2.20c, cone head boiler rivets, 2.30c. Small rivets 75, 10 and 10 off.

Bolt and Nut Discounts

Carriage bolts, ⅜ x 6 inches, smaller and shorter, rolled threads, 75 and 10; cut threads 75 and 5; larger and longer, 70 and 2½.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller and shorter, rolled 75, 10, and 5; cut, 75 and 10; larger and longer, 70 and 7½.

Gimlet and cone point lag or coach screws, 80 and 10.

Hot pressed square, blank or tapped nuts, $5.70 off list; hot pressed hexagon blank or tapped, $6.30.

Cold pressed C. & T. square, blank or tapped, $5.70 off; hexagon, blank or tapped, ⅝-inch and larger, $6.60 off; ½ inch and smaller, $7.20 off.

Structural Shapes. — No especially large contracts have been placed with fabricators this week and some in the trade do not believe that active contracting will be resumed until after the first of the year. The McClintic-Marshall Construction Co. has taken an order for 3,000 tons of fabricated steel for the new plant of the Crucible Steel Co. of America, to be built at Syracuse, N. Y.; 3,000 tons from the Scoville Mfg. Co., Waterbury, Conn., and 400 tons for bridge work from an eastern railroad.

Consumers advise that it is practically impossible to obtain structural material for anything like prompt delivery. Some mills have sold both plates and shapes for third quarter delivery. Quotations follow:

Standard structural shapes, 1.45c to 1.60c for forward shipment. For extras see card of Sept. 1, 1909.

Merchant Pipe. — The Youngstown Sheet & Tube Co. last Friday sent out its new price list on wrought iron pipe, effective Jan. 1. List prices are identical with those provided by the new steel pipe card which will go intq effect Jan. 1. Weights of iron pipe will be the same as those of steel pipe. In past years, both iron and steel pipe have been made on the iron pipe schedule of weights. Iron pipe weighs 2 per cent less per

cubic foot than steel pipe. Discounts on black and galvanized, extra strong and double extra strong iron pipe remain unchanged.

What was said regarding steel pipe in the Dec. 12 issue applies to iron pipe. In brief, merchant weight pipe will not be manufactured hereafter. Other independent interests already have signified intentions of adopting the new schedule of steel pipe weights on Jan. 1 which practically insures the trade of the success of changes proposed by the National Tube Co.

An inquiry for 180 miles of 12-inch line pipe for West Virginia shipment has not yet been closed. We continue to offer old discounts on steel pipe which are subject to the usual preferential discount to the large buyer:

Iron and Steel Pipe Basing Prices.

STEEL.

	Butt.		Lap.	
	Black.	Galv.	Black.	Galv.
⅛, ¼ and ⅜ inch.	72	52	..	..
½ inch	76	66	..	..
¾ to 3 inch	79	71	..	..
2 inch	..	..	76	68
2½ to 6 inch	..	..	78	70
7 inch to 12 inch	..	..	76	66
13 to 15 inch	..	..	53	..
Extra Strong, Plain Ends.				
⅛, ¼ and ⅜ inch.	68	58	..	..
½ inch	73	67	..	..
¾ to 1½ inch	77	71	..	..
2 to 3 inch	78	72	..	..
2 inch	..	..	74	66
2½ to 4 inch	..	..	76	68
4½ to 6 inch	..	..	75	67
7 to 8 inch	..	..	68	58
9 to 12 inch	..	..	63	53
Double Extra Strong Plain Ends.				
½ inch	63	57	..	..
¾ to 1¼ inch	66	60	..	..
2 to 2½ inch	68	62	..	..
2 inch	..	..	64	58
2½ to 4 inch	..	..	66	60
4½ to 6 inch	..	..	65	59
7 to 8 inch	..	..	58	48

IRON.

⅜ inch	66	47	..	..
½ inch	70	57	..	..
¾ to 2½ inch	73	62	..	..
2 inch	..	..	69	59
2½ to 6 inch	..	..	71	62
7 to 12 inch	..	..	69	56
Extra Strong Plain Ends, Card Weight.				
⅜ inch	64	53	..	..
½ inch	68	61	..	..
¾ to 1½ inch	72	63	..	..
2 and 2½ inch	73	64	..	..
2 inch	..	..	67	59
2½ to 4 inch	..	..	71	62
4½ to 6 inch	..	..	70	61
7 to 8 inch	..	..	64	54
9 to 12 inch	..	..	59	48
Double Extra Strong Plain Ends, Card Weight.				
½ inch	58	50	..	..
¾ to 1½ inch	61	53	..	..
2 and 2½ inch	63	55	..	..
2 inch	..	..	56	50
2½ to 4 inch	..	..	61	55
4½ to 6 inch	..	..	60	54
7 and 8 inch	..	..	53	43

Plugged and reamed pipe is furnished at 2 points higher price, either butt or lap weld.

The above discounts are for full weight pipe, subject to a variation of 5 per cent, merchant pipe, when specified, being furnished up to 6 inches at one point higher discount (lower price).

Boiler Tubes.—Both iron and steel boiler tube discounts will be based on revised classification and list prices after Jan. 1. There is a rather heavy demand for both grades of tubes. Discounts are as follows:

	Steel.	Iron.
1½ inch	..	..
1¾ to 2¼ inch	62	47
2½ inch	64½	52
2¾ to 3¼ inch	69½	54½
3½ to 4½ inch	72	57
5 and 6 inch	64½	..
7 to 13 inch	62	..

To destination east of Mississippi river will be sold at delivered discount for carloads lowered by 2 points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburgh. Usual extras to jobbers and boiler manufacturers.

Wire.—Manufacturers of wire products are booking heavy tonnages for delivery the early part of next year. The $1.75 quotation is being maintained by all interests. As said in previous reports, the wire market never was on sounder basis than that enjoyed at the present time. Cut nails continue to be quoted at $1.70 by western makers. The following quotations prevail:

Wire nails, jobbers' carload lots, $1.75, retailers' carload lots, $1.80; cut nails (western makers), jobbers' lots, $1.70; painted barb wire, jobbers' carload lots, $1.75; retailers' carload lots, $1.80, with 40c for galvanizing; plain wire to jobbers in carloads, $1.55; and to dealers, in carloads, $1.60; polished staples, $1.75; galvanized staples, $2.10.

Wire Rods.—Manufacturers are unable to offer large tonnages of wire rods. Mills are holding firmly to the $30 quotation and representatives have been advised not to sell until after first consulting company officials. We quote both Bessemer and open-hearth wire rods at $30, Pittsburgh.

Car Wheels.—It is understood that the Pennsylvania railroad has placed orders for car wheels for 1,500 freight cars purchased a fortnight ago. Car wheels are quoted as follows: 33-inch freight car wheels, $15 to $15.50; 36-inch passenger train car wheels, $19 to $19.50.

Coke. — A difference of opinion is expressed regarding the coke market. One dealer today reported a sale of about 50 cars of furnace coke for prompt shipment at $4.25, ovens. Coke has not sold above this figure for several years. Other dealers advise that they are unable to obtain more than $4 for prompt furnace fuel. Several sales of 10 cars each have been made at that figure since last Friday.

Contract furnace coke has sold as high as $3.50, ovens, one dealer reporting a sale of 10,000 tons a month through the first half at that figure. Other dealers and producers advise they have been unable to obtain more than $3.25, ovens. We quote contract furnace coke at $3.25 to $3.50, ovens. The Connellsville *Courier* for the week ending Dec. 14, says that production was 389,064 tons, a decrease of 3,942 tons, compared with the week before. Shipments decreased 74 cars. Quotations follow:

Connellsville furnace	$4.00
Connellsville furnace contract	3.25 to 4.00
Connellsville foundry	4.50 to 4.75
Connellsville foundry contract	4.00 to 4.25

Old Material.—The market for old materials has been quiet the past week and quotations remain unchanged. Many of the dealers believe that present conditions will continue for three or four weeks. Heaviest consumers are finding no difficulty in obtaining good quality heavy melting steel at between $15 and $15.25, delivered at the mill.

Unusually heavy tonnages of all grades are being offered and, to a great measure, the present weakness is the result of the quantity of available material in this section of the country. Heavy melting steel is selling almost $2.50 a ton below basic pig iron. Usually heavy melting steel and basic pig iron are quoted at about the same figure. The following quotations continue to represent the market:

Heavy melting scrap	$15.00 to 15.25
Rerolling rails	16.50 to 17.00
Malleable	14.00 to 14.25
Agricultural malleable	13.50 to 13.75
Bundled sheet scrap	13.30 to 13.50
Iron axles	26.00 to 27.00
Old iron rails	16.75 to 17.25
Stove plate	11.00 to 11.50
No. 1 wrought scrap	15.25 to 15.50
Old car wheels	16.25 to 16.50
Low phosphorus	18.00 to 18.50
Machine shop turnings	10.75 to 11.00
No. 1 busheling	14.00 to 14.25
Country mixed	11.00 to 11.25
Cast borings	10.25 to 10.50
No. 1 cast scrap	14.25 to 14.50

Construction to be Started Soon

The Alton Steel Co., Alton, Ill., has given notice of an increase in its capital stock from $10,000 to $600,000. The following officers have been elected to take the place of the former temporary officers: T. S. Clarke, president; J. R. Hastings, vice president; E. J. Englin, treasurer; J. V. E. Marsh, secretary. The capital stock was originally placed at $10,000 in order that the concern might have a temporary corporate existence to purchase the site for the proposed steel mill and to facilitate the starting of the company. A large force of men has been put at work on the new site, and construction work will be under way shortly. Officers of the Alton company have stated that it will be ready to begin turning out product by July 1, 1913. Orders for the equipment of the plant have been placed for some time.

In order that it might fill its contracts the plant of the Oneida Foundry Co., Oneida, N. Y., is being run night and day.

CHICAGO

Specifications Heavy, Prices Firm

Office of THE IRON TRADE REVIEW,
1328 Monadnock Blk., Dec. 23.

Specifications, evenly distributed throughout the finished lines, have continued during the past week at a surprising rate. The leading interest reports a total but little below that received during the second week of the month, and far in excess of the first week. This should make December one of the biggest months of the year. Although the independent sellers in this district report a continued falling off to some extent, the total is keeping up remarkably well and will be but little less than that for November. Prices are very strong, and the market for bar iron is now quotable at from 1.60c to 1.65c. While new business is not equal to the volume of specifications, the only decreases are caused by the refusal of independent producers to accept tonnage for second half delivery.

Pig Iron.—The Haskell & Barker Car Co. is inquiring for from 2,000 to 5,000 tons of charcoal iron, and the Bettendorf Axle Co. has taken prices on 250 tons of ferro-silicon for delivery during the first half. Other inquiries, however, as a rule, are for very small tonnages, and the market, particularly for southern iron is very quiet. There appears to be considerably more activity in northern iron, a strong Chicago furnace interest reporting the past week as the best since election. This upholds the probability of activity in January. Tentative inquiries for second half delivery are still appearing, and will probably constitute the bulk of the next movement in the market.

Quotations on northern iron are decidedly firm, as the furnaces are well sold up for first half delivery and have no trouble in disposing of off grades. Much of the latter, consisting of low grade iron, has been used to make up orders for regular grades which could not be supplied. Southern quotations appear to be vacillating between strength and weakness, and while in the present dull market some of the southern producers would probably make lower prices for attractive business, a buying movement later in the winter would undoubtedly strengthen their quotations. These quotations still continue nominal in part, owing to the lack of sales of consequence, but present prices appear to be $14, Birmingham, for first quarter and $14.50 for first half. Some business for prompt shipment has been placed at less than the first named figure.

The following prices represent the market for Chicago delivery, except northern foundry and malleable Bessemer, which are quoted f. o. b. local furnaces:

	First quarter.	First half.
Lake Superior charcoal	$18.75	$18.75
Northern foundry No. 2	18.00	18.00
Southern foundry No. 2	18.35	18.85
South'n Silveries, 5 per cent sil.	.....	19.85
Jackson co. silv'r's 8 per cent.	21.90	22.40
Malleable Bessemer	18.00	18.00
Alabama basic	.....	18.85

Merchant Bars.—Bar iron is much stronger, and although it may be possible to place some business at 1.57½c and the tonnage going at 1.65c is small, the market is quotable at from 1.60c to 1.65c. Specifications continue to be at about the same rate as for the past two weeks, which is a considerable decrease from the November average. Specifications for steel bars, however, are keeping up at a phenomenal rate for this time of the year, and prices are very strong.

We quote f. o. b. Chicago, as follows:

Bar iron, 1.60c to 1.65c, hard steel bars, rerolled, 1.65c to 1.75c, soft steel bars, bands and small shapes, 1.63c; hoops, 1.63c; smooth finished machinery steel, 1 inch and larger, 1.78c; shafting 60 per cent off list for carload lots, 55 per cent off for less than carloads.

On iron and steel from local stock,

Bar iron, 1.95c per pound base; soft steel bars, 1.95c per pound base; soft steel hoops, 2.20c, full extras.

Structural Material. — Contrary to expectations early in the week, specifications for this material have continued at almost the same rate. This will undoubtedly make December one of the big months of the year with some of the producers in this territory.

The Chicago Steel Products Co. has taken 1,045 tons from the Grand Calumet River Electric Co. for a power house near Pullman, Illinois, and the American Bridge Co. has taken 5,600 tons from the C. N. W. Ry. Co. for various spans. The same fabricator has also taken 1,200 tons from the Chicago, St. Paul, Minneapolis & Omaha Ry. Co. for deck and through girder spans. The receivers of the Wabash Railroad Co. have let a contract for one 55-foot S. T. deck plate girder span, one 60-foot S. T. deck plate girder span, I-beam stringers, etc., at St. Charles, Mo. We quote, f. o. b. Chicago, as follows:

Beams and channels, 15 inch and under, 1.68c. For extras, see Pittsburgh report.

Store prices are as follows:

All angles, 3 inches and larger, including 6 inches, $2.05 per 100 pounds; angles over 6 inches, $2.15 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $2.05 per 100 pounds, base; channels, 3 inches and larger, $2.05 per 100 pounds, base.

Rails and Track Fastenings.—Specifications for both rails and track fastenings are keeping up on a par with other finished lines, and it appears that the year will close with December one of the big months of the year. While quotations are very firm, no further advances were announced, but it may be that independent producers will quote higher prices for second half business when their books are open for delivery at that time.

We quote light rails f. o. b. Chicago, and track fastenings f. o. b. Joliet, as follows:

Light rails, carloads, 25 to 45-pound, 1.30c; 16 to 20-pound, 1.35c; 12-pound, 1.40c; 8-pound, 1.50c.

Light section relayers, 45 pounds and under, subject to inspection, $22 to $24; standard section relaying rails, subject to inspection.

Track fastenings, f. o. b. Joliet, angle bars 1.50c; railroad spikes, 1.95c; smaller size spikes, 1.75c base; track bolts with square nuts, 2.30c to 2.40c.

Plates.—Activity in this material has continued throughout the past week and is again increased by the car orders pending. It is understood that orders for about 12,000 cars previously mentioned will be closed before the first of the year. The total car buying this year has been enormous, and has been sufficient to congest the shops of the builders throughout the year to come. Some builders in the west have already specified most of their contracts for material to be delivered during the second half of next year in order to assure a place

on rolling schedules. In spite of the great number of cars already contracted for, it is understood that additional buying will be done after the first of the year.

Railroad activity is still abnormal, the total of orders either placed or pending calling for 13,445 cars. The Grand Rapids & Indiana is in the market for 20 cabooses, and the Erie has ordered 55 steel underframe coaches from the Standard Steel Car Co. The M., K. & T. has ordered 2,000 30-ton box cars from the American Car & Foundry Co., and the Norfolk and Western has let a contract to the Mt. Vernon Car Mfg. Co. for 500 box cars and to the Ralston Steel Car Co. for 500 steel stock cars. It is understood that the Chicago, Burlington & Quincy has ordered 2,000 additional freight cars from the Haskell & Barker Car Co., but the item has not been confirmed. The Illinois Central has ordered 2,500 all steel gondola cars and 500 flat cars from the Bettendorf Axle Co., and is in the market for 1,000 additional gondolas, 500 stock cars, 500 refrigerator cars, 500 fruit cars and 70 cabooses.

We quote f. o. b., Chicago, as follows:

Tank plates, ¼ inch thick, 6⅝ to 100 inches wide, 1.68c. For extras, see Pittsburgh report.

Store prices are as follows:

Tank steel, ¼ inch and heavier, up to 72 inches wide, $2.05.

Bolts, Nuts and Rivets. — While somewhat lighter than the average for November, specifications for this material are reflecting prevailing conditions in other finished lines, and keeping up remarkably well. The recent advances appear to have accelerated buying rather than retarded it, and the year closes with exceedingly good prospects for a continuation of prosperity.

We quote prices on bolts, nuts and rivets as follows:

Rivets

Structural rivets, ¾ to 1¼ inches, 2.38c, base, Chicago, in carload lots; boiler rivets, 0.10c additional.

Bolt and Nut Discounts

Carriage bolts up to ⅝ x 6 inches, rolled thread, 75-10; larger sizes, 70-2½.

Machine bolts, up to ⅝ x 4 inches, rolled thread, 75-10-5; cut thread 75-10; larger sizes, 70-7½.

Hot pressed nuts, square head, $5.70 off per cwt.; hexagon, $6.30 off per cwt.

Sheets.—The condition of the sheet market is practically unchanged, specifications keeping up well, and considerable second half business being offered. While mills are still maintaining their attitude against the latter, they have been forced to accept it in many cases, and it may be that part of the second half capacity will be exhausted without the addition of further contracts.

We quote f. o. b., Chicago, as follows:

Blue annealed, No. 10, 2.15c; No. 12, 2.20c. Box annealed, No. 28, 2.70c. Galvanized No. 28, 3.95c.

For mill prices, see Pittsburgh report. Freight to Chicago, 18 cents.

Wire Products. — Activity in this market is being maintained at practically the same rate. The advance in quotations by the leading interest has caused no diminution in the buying, which is spread over all lines. Manufacturers are buying liberally for delivery 60 days ahead.

We quote f. o. b., Chicago, as follows:

Wire nails, jobbers' carload lots, $1.93; retailers' carload lots, $1.98; retailers' less than carload lots, $2.03; painted barb wire, jobbers' carload lots, $1.93; retailers' carload lots, $1.98; retailers' less than carload lots, $2.03, with 40c for galvanizing; plain wire, jobbers' carload lots, $1.73; retailers' carload lots, $1.78.

Merchant Pipe and Tubes.—Seasonal dullness characterizes the market for merchant pipe and tubes to a great extent, but prices are very firm. Active buying is expected after the first of the year, both by manufacturers and by the jobbing trade to cover requirements for spring building operations.

We quote store prices on merchant pipe and tubes as follows:

Iron and Steel Pipe Basing Prices.

	Steel. Black.	Steel. Galv.	Iron. Black.	Iron. Galv.
Butt.				
⅛ inch and ¼ inch.	69.2	48.2	62.2	41.2
⅜ inch	73.2	62.2	67.2	51.2
½ inch to 1½ inch.	76.2	67.2	70.2	58.2
Lap.				
2 inch	73.2	64.2	67.2	57.2
2½ inch to 6 inch.	75.2	66.2	68.2	59.2
Card Weight.				
7 inch to 12 inch...	72.2	61.2	66.2	55.2
Extra Strong Plain Ends.				
Butt.				
⅛, ¼, ⅜ inch.....	64.2	52.2	59.2	47.2
½ inch	69.2	57.2	64.2	52.2
2 inch to 3 inch....	74.2	62.2	....	....
Lap.				
2 inch	70.2	58.2	65.2	53.2
7 inch to 8 inch....	64.2	52.2	59.2	47.2
Double Extra Strong.				
Butt.				
½ inch	57.2	45.2	....	....
¾ inch to 1¼ inch	60.2	48.2	....	....
Lap.				
2 inch	58.2	46.2	....	....
2½ inch to 6 inch..	59.2	47.2	....	....
7 inch to 8 inch....	52.2	40.2	....	....

Tubes

	Lap weld steel. Per cent.	Charcoal iron. Per cent.	Shelby seamless. Per cent.
1 inch	37	..	55½
1¼ to 2¼ inch.....	53	38	34
2½ to 3½ inch.....	63	48	44
3½ to 4½ inch.....	65½	48	44
5 to 6 inch.....	53	..	..

Cast Iron Pipe.—The city of Toledo will take bids for 1,500 tons of water pipe on Dec. 27, and Sioux City, Ia., took bids on 500 tons Saturday. Other than these two tonnages, no inquiries of any consequence have appeared. Sales consist of very small lots. After the first of the year, it is expected that many municipalities will have appropriations available for construction and will go into the market for heavy tonnages. Prices are unchanged, but firm.

We quote f. o. b., Chicago, as follows:

Four-inch water pipe, $31, 6 to 12 inches, $29, larger sizes, $28, gas pipe, $1 a ton higher.

Old Material. — The scrap market remains quiet, with tendencies toward weakness on some items occasioned by the appearance of fair railroad lists. Quotations on re-rolling rails have receded somewhat from the maximum, as considerable tonnage has been sold by the railroads in the past few weeks and consumers in this territory can see no reason for paying higher prices when they do not bring out sufficient tonnage for their needs. The shortage in this territory still continues, however, to a considerable extent. Some good lists have been issued by the railroads during the week, including one totaling 3,464 tons sent out by the Rock Island Lines, on which bids close next Friday. The principal items of this list were 600 tons of No. 1 steel rails and 700 tons of No. 1 railroad wrought. The Chicago, Milwaukee & St. Paul has invited bids on 2,175 tons of scrap, the principal item being 500 tons of steel rails, and a like amount of No. 1 wrought. A list has been issued by the C., B. & Q., totaling over 3,000 tons, and the Chicago & Alton has invited bids on a list of 1,000 tons.

We quote for delivery in consumers' yards, Chicago, as follows:

Gross Tons

Old car wheels	$15.75 to 16.25
Old iron rails	17.00 to 17.50
Rerolling rails (5 ft. and over)	16.25 to 16.75
Old steel rails (3 ft. and und.)	14.50 to 15.00
Frogs, switches and guards	13.75 to 14.25
Heavy melting steel	13.50 to 14.00
Shoveling steel	13.00 to 14.00

Net Tons

No. 1 R. R. wrought	$12.75 to 13.25
No. 2 R. R. wrought	12.00 to 12.50
Arch bars and transoms	16.75 to 17.25
Knuckles, couplers and springs	12.75 to 13.25
Shafting	16.50 to 17.00
Iron car axles	21.50 to 22.00
Steel car axles	17.75 to 18.25
Locomotive tires	13.50 to 14.40
Dealers forge	10.75 to 11.25
Pipe and flues	10.00 to 10.50
No. 1 cast	13.50 to 14.00
No. 1 busheling	11.25 to 11.75
No. 2 busheling	8.50 to 9.00
No. 1 boiler cut	10.00 to 10.50
Boiler punchings	13.00 to 13.50
Cast and mixed boring	7.25 to 7.75
Machine shop turnings	8.25 to 8.75
Railroad malleable	13.50 to 14.00
Agricultural malleable	12.25 to 12.75
Angle bars, splices, etc., iron	16.50 to 17.00
Angle bars steel	12.50 to 13.00
Stove plate and light cast scrap	11.00 to 11.50

CLEVELAND

Active Chartering of Vessel Tonnage

Office of THE IRON TRADE REVIEW,
Penton Bldg., Dec. 23.

Iron Ore.—Contracting for the movement of ore has continued steadily during the past few days at the advance of 5 cents per ton, making the rate from the head of the lake 45 cents. The only large fleet that has not made large contracts is the Gilchrist fleet, which is to be sold on the order of the federal court at a not far distant date. In some cases, fleets have agreed to carry more tonnage than they carried on season contracts in 1912 and, if shippers take all the vessel capacity that they have under option, the total shipments for 1913 will be at least 50,000,000 tons.

The lull in ore buying continues, but the sellers are very well satisfied with their record up to date. Navigation has been slow in closing on account of the mild weather. The last boat to pass through the Soo was a Canadian steamer which reached Buffalo Sunday.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.40; Mesabi Bessemer, $4.15; old range non-Bessemer, $3.60; Mesabi non-Bessemer, $3.40.

Pig Iron.—The market is firm, but very few sales are being made. Although in the Buffalo district a considerable tonnage has been sold for delivery into last half of the year, Cleveland foundrymen are not yet disposed to contract for delivery beyond July 1, and it has not been determined whether sellers in this territory will follow the example of the Buffalo furnace in advancing quotations 50 cents for delivery during the last half. For delivery this month, and the first half of next year, we quote as follows:

No. 1 foundry	$18.25 to 18.75
No. 2 foundry	17.75 to 18.00
No. 2 southern	18.35 to 18.85
Bessemer	18.15 to 18.40
Lake Superior charcoal	19.10 to 19.75
Silveries 8 per cent silicon	21.55
Bessemer ferro, 14 per cent	29.55

Coke.—There is a marked shortage of cars on the Norfolk & Western railroad and considerable difficulty is being experienced in making delivery from the Pocahontas coke region, but railroads handling Connellsville coke are not suffering as they did a few weeks ago from car shortage. Prices are being well maintained, but the market is not active. We quote:

Connellsville furnace coke, $3.90 to $4.00 for prompt delivery, and $3.50 on contract for first half; Connellsville foundry coke, $4.50 to $4.65 for prompt, and $4.25 to $4.50 on contract.

Finished Material.—Unusual activity for a pre-holiday period has characterized the past few days. Perhaps the most marked characteristic of business is the indifference of purchasers in regard to prices. For example, an erector in Toledo did not hesitate at all about paying 1.96c, delivered, for a very fair tonnage of structural material and eastern Pennsylvania mills are experiencing no difficulty in getting 1.70c to 1.75c at their plants for shapes to be delivered within three to six weeks, while 1.60c to 1.65c at eastern Pennsylvania mills is freely paid for plates. Although these Pennsylvania mills have not made any formal advances, their disposition is to ask higher prices and they are doing so in some cases. "The mills," said one large buyer, "charge as high a price per ton for 1,000 tons as for one ton, and the less one takes, the better they are pleased." The Republic Iron & Steel Co. took orders last week for 60,000 tons of bars for delivery during the last half of 1913 and now has no further bar tonnage to offer for delivery at any time next year. The same company will be unable to make any further sales of crude steel and its ability to sell plates will depend largely upon its supply of steel. Following the buying of 5,000 tons of 85-pound rails from the Carnegie Steel Co., the Nickel Plate railroad has placed an order for the same tonnage with the Lackawanna Steel Co. On the bidding on the piers for the Clark avenue bridge, the Phee Construction & Engineering Co., Chicago, was the low bidder on the two water piers and the Fath Construction Co., Cleveland, was low on the land piers. The tonnage of sheet piling required has not been definitely stated. On the superstructure of the new City Hall, the low bidder was the J. L. Stuart Co., of Pittsburgh, at $1,034,000, and it is expected that the contract will be awarded to this firm.

Old Material.—Until after the New year and the inventory season, the scrap market is not expected to recover from its weakness. It is very sluggish, there being no demand whatever for some grades, and but little for the others. Machine shop turnings, cast borings, heavy melting steel, bundled sheet scrap, wrought drillings, No. 1 railroad wrought and No. 1 busheling have been lowered. Turnings, borings and drillings are reduced largely because of the excessive supply attendant upon the annual cleanup of shops. Other declining grades have reached their positions through large supplies and small demands, combined with the fact that some of the mills are out of the market, among them being local rolling mills. With the cold weather at hand, agricultural scrap probably will be light, small dealers throughout the country being forced to stop collecting it. This will have a tendency to steady the market on this grade. Revised quotations follow:

Gross Tons.

Old iron rails	$17.75 to 18.50
Old steel rails (under 6 ft.)	15.00 to 15.50
Old steel rails (over 6 ft.)	16.25 to 16.75
Relaying rails	25.00 to 26.00
Old steel boiler plate	11.50 to 12.00
Malleable iron (railroad)	14.50 to 15.00
Steel axles	19.50 to 20.00
Axle turnings	12.50 to 13.00
Malleable iron (agricultural)	13.00 to 13.50
Heavy steel	13.25 to 13.75
Country mixed steel	11.00 to 11.50
Bundled sheet scrap	11.50 to 12.00

Net Tons.

No. 1 R. R. wrought	$14.00 to 14.50
No. 1 busheling	12.00 to 12.50
No. 1 machine cast	13.50 to 14.00
No. 1 dealers' wrought	11.50 to 12.00
Machine shop turnings	7.75 to 8.00
Pipes and flues	10.00 to 10.50
Wrought drillings	7.75 to 8.00
Cast borings	7.50 to 7.75
Stove plate	10.50 to 11.00
Wrought iron arch bars	17.00 to 17.50
Wrought iron piling plate	16.00 to 16.50

Destructive Fire.—The Carnegie plant of the Carbon Steel Co., Pittsburgh, at East Carnegie, Pa., was almost totally destroyed by fire, Dec. 21. The plant was formerly owned by the Damascus Steel Co. Origin of the fire is not known and loss has not been estimated.

Students at the Carnegie Institute of Technology are enjoying work in a recently equipped metallurgical laboratory in which pig iron and pig steel are being made in an electric furnace, one of the few furnaces of its kind in the Pittsburgh district.

PHILADELPHIA

Unusual Business for Holidays

Office of THE IRON TRADE REVIEW,
Philadelphia, Dec. 23.

For a period when the effect of the holidays, as a rule, is squarely upon the market, eastern makers of finished iron and steel materials are receiving an unusually liberal amount of new business. This is spread pretty evenly over all products, but is conspicuous in plates and billets. Some heavy lots of billets have been taken or are under negotiation. Pittsburgh buyers of shapes have been seeking tonnage of eastern makers to relieve the delayed deliveries of the mills there and are offering to accept four months delivery at full eastern schedule. Pig iron is moderately quiet. Recent purchases of cast iron pipe makers, it develops, reached about 25,000 tons. A sale of 10,000 tons of heavy melting steel at $15.25 for second quarter more clearly defines the market. Scrap in general is quiet and soft.

Pig Iron.—Christmas week finds the eastern pig iron market in the usually neglected state of the holiday period. This condition of trading is not expected to be altered greatly before well along in January, as stock taking and other work of closing up the year are absorbing the attention of consumers. Considerable low grade iron is being offered in the market by makers, including a Coatesville steel company which recently blew in a second furnace, and it develops that the recent buying by the Delaware river pipe makers has been heavier than reported. The purchase of low-grade iron in this district in the past two weeks has reached fully 25,000 tons. A New Jersey pipe maker took 10,000 tons of No. 2 plain and forge, divided between two makers, at prices of about $17.60 to $17.75, delivered. The leading pipe interest has been a buyer of several thousand tons for its New Jersey plant. A third interest has bought liberally. Usually the prices obtained have been included in the range of $17.50 to $17.75, delivered, but some metal has been obtained as low as $17, delivered by water transportation, and on a small lot this figure was shaded. There is a moderate movement of foundry irons in small single lots at prices of $18.50, Philadelphia, or higher for No. 2X. The $18.25, Philadelphia price, which has been abroad until very recently, seems to have been finally passed and $18.50 is now the minimum. The Norfolk & Western railroad which was inquiring for its last half requirements of its Roanoke shop, amounting to about 5,000 tons of foundry grades, decided on final action not to buy at this time. This decision was influenced by the advances asked by makers, some of which were quite prohibitive. One or two Virginia makers were willing, however, to take third quarter tonnage at only a small advance over the $15.50, furnace, schedule for second quarter No. 2X. A Schuylkill valley steel maker has been short on its basic supply and is reported to have purchased 3,000 tons of early basic or off-basic from a nearby steel producer. The price is not stated. Leading buyers of basic are well covered. Three or four buyers of low phosphorus iron in the Pittsburgh district are in the market with aggregate inquiries of 5,000 tons or more, and there continues a number of small eastern inquiries. Some eastern makers have booked so much tonnage that they are out of the market. One of the Crane furnaces which has been on low phosphorus has been turned to basic.

We quote for prompt and last quarter shipment delivered to consumers plants, in Philadelphia and vicinity as follows:

Eastern Pa. No. 1X foundry	$18.75 to 19.00
Eastern Pa. No. 2X foundry	18.50 to 18.75
Eastern Pa. No. 2 plain	18.25 to 18.50
Standard forge (Eastern Pa.)	17.50 to 17.75
Basic (Eastern and Central Pa.)	18.00 to 18.25
Virginia No. 2X	18.65 to 18.80
Southern No. 2	18.00 to 18.50
Malleable	19.50 to 20.00
Low phosphorus, Philadelphia	24.00 to 24.50

Iron and Steel Bars.—Sales of prompt steel bars up to carload lots continue to be made by eastern mills at 1.85c, delivered Philadelphia. For shipment outside this district, orders have been taken at 1.80c, Philadelphia base. Leading independent makers in the Pittsburgh district who have been freely booking third quarter and last half contracts in steel bars at 1.40c to 1.45c, Pittsburgh, or 1.55c to 1.60c, Philadelphia, have taken considerable tonnage and are now less active in offering such propositions to buyers. Bar iron is in good demand and prices are strong as quoted.

We quote for delivery to consumer's plants in Philadelphia and vicinity: Steel bars at 1.55c to 1.60c on contract and common bar iron at 1.67½c to 1.77½c. Prompt steel bars on mill shipments are quoted at 1.85c to 1.95c delivered and from store are quoted at 2c to 2.15c, delivered. Cut nails are quoted from $1.85 to $1.90, Philadelphia. Shafting is quoted at 60 and 55 off in base territory.

Shapes and Plates.—Buyers of structural shapes from the Pittsburgh district have been visiting eastern mills the past week, seeking lots of 1,500 tons or more upon which they were satisfied to accept deliveries in four months at the eastern schedule, or about 1.60c, mill. Eastern makers, however, are getting so well filled themselves that it is questionable whether some of them can offer the desired shipments. These buyers report that with the leading middle western makers deliveries in shapes run from six to nine months. Leading eastern Pennsylvania plate makers report an unusually heavy volume of new business and specifications have been entered the past week, most of which represents new orders taken at 1.60c and 1.65c, Pittsburgh. Very little of the heavy specifying, it is said, is due to lower-priced contracts expiring with the year. The Phoenix Bridge Co. will place with eastern makers 1,500 tons of plates included in the 7,000 tons of steel required for the Boston pier improvements which the former has taken, as reported. The Chesapeake Iron Works has 400 tons for the Dan River Power Co., Danville, Va. Bids are being asked for 500 tons of steel column cores for the Metropolitan, formerly known as the Lasher building, this city.

We quote delivered to consumers' plants in Philadelphia and vicinity: Sheared steel plates on contract 1.60c to 1.75c; universal steel plates on contract, 1.60c to 1.80c; sheared plates for early delivery, 1.75c to 1.85c; universal plates for early delivery 1.80c to 1.85c; structural shapes on contract 1.60c to 1.75c; structural shapes for early delivery 1.80c to 2.00c. Plates and shapes from store are quoted at 2.15c to 2.25c delivered.

Sheets.—A good inquiry for sheets continues to come to eastern makers, but they are finding difficulty in keeping up with the demands of consumers and deliveries are still losing ground. Prices are strong.

We quote for delivery to consumer's plants in Philadelphia and vicinity, No. 10 gage blue annealed sheets at from 1.95c to 2.05c.

Semi-Finished Steel.—One round lot of open-hearth billets has been sold

for delivery in this territory, and some heavy negotiations continue under way. A New Jersey consumer is still negotiating for a block of 15,000 to 20,000 tons of both Bessemer and open-hearth billets for all next year delivery. There is a liberal inquiry in smaller lots, but many of the eastern makers are so well sold on their output that they are unable to quote. Prices are very strong as a consequence.

We quote delivered to consumer's plants in Philadelphia and vicinity 4 x 4-inch open-hearth and Bessemer rolling billets at $28.50 to $30.50 and forging billets at from $34.50 to $38.50.

Old Material.—A leading Coatesville consumer has purchased 10,000 tons of heavy melting steel for first quarter delivery at $15.25, delivered, which accurately fixes the forward market on strictly first-class steel. For early delivery, buyers are able to pick up lots up to about 500 tons at $14.75 to $15, delivered, and in some cases down to $14.50, delivered. The embargo which has been upon the works of the Lukens Iron & Steel Co., at Coatesville, has been lifted. The market generally continues quiet with moderate buying and prices are easy in most grades. The active demand for car wheels for export to Canada and Italy continues, but this material is relatively scarce.

We quote gross tons delivered to consumers' plants in eastern Pennsylvania and western New Jersey, as follows:

Old iron rails	$18.00 to 18.50
Old steel rails (rerolling)	16.25 to 16.75
No. 1 heavy melting steel	14.25 to 15.25
Old car wheels	15.25 to 15.75
Old iron axles	25.00 to 26.00
Old steel axles	20.50 to 21.50
No. 1 railroad wrought	16.25 to 16.75
Wrought pipe	13.00 to 14.00
Cast borings	11.25 to 11.75
Machine shop turnings	11.25 to 11.75
Heavy cast (broken)	15.00 to 15.50
Malleable	13.50 to 14.00
Stove plate	11.50 to 12.00
No. 1 forge	13.50 to 14.00
Low phosphorus	19.50 to 20.00

Freight rates per ton on scrap from Philadelphia to principal eastern consuming points are: $0.60 to Ivy Rock, Pa.; $0.65 to Phoenixville, Pa.; $0.80 to Coatesville, Pa.; $0.85 to Bethlehem, Pa., Reading, Pa., and Roebling, N. J., $1.10 to Pottsville, Pa., Lebanon, Pa., and Columbia, Pa.; $1.20 to Harrisburg and Steelton, Pa.; $1.40 to Milton, Pa.

To Discuss Ore Taxation

The Wisconsin commission on the conservation of natural resources is holding a series of hearings, the results of which will determine the recommendations to be made in the report of the commission to the legislature, which will meet in January. The problem of taxing ore deposits is one of the most serious before the commission, and at this time it is a matter of choosing between two methods of taxation, the Minnesota plan of taxing on the amount of ore taken out, and the Michigan plan of taxing ore lands on the basis of appraisals and estimates of the ore deposits.

BIRMINGHAM

Trading Light Prices Unsettled

Office of THE IRON TRADE REVIEW,
Birmingham, Ala., Dec. 23.

Pig Iron.—The trading in all quarters of this territory is very light. Actual sales for the week are even smaller than that of the week previous, while the inquiry now pending in definite form is not promising. As has been the case for some three weeks past, the matter of price is more or less undetermined. In certain sections, considerable tonnage of local brands for early delivery has no doubt been offered at figures around a basis of $13.50 per ton at Birmingham for No. 2 foundry, and the available tonnage for the first quarter at $14 per ton has probably increased within the past 10 days. The price being asked for second quarter deliveries is $15 per ton at Birmingham, but without sales at such figures, except where small tonnages of favorite brands are required. Contrary to expectations, the furnace forwardings have not been affected to any appreciable extent by reason of the season. There is some tonnage that is being withheld on orders at the request of the purchaser, but in the majority of cases, shipping instructions have not been revised, notwithstanding the fact that practically all foundry plants will close down for a week or ten days from today. No further mention is made of the tonnage offered for re-sale some 10 days ago, and in fact, it is hardly believed that a vigorous effort has been made in any case to dispose of the tonnage undelivered on contracts entered at the higher figures; however, the condition of the market is quite unsettled at this time, and a conservative course on the part of the trade is generally anticipated. For the time being, the furnace companies are most interested in the matter of supply of raw material during the next 10 days, as stocks of both coke and ore have been practically depleted, and the output will be materially less than normal for some time after Jan. 1. With the market very quiet, and the several parties concerned apparently content to await further developments, asking prices are about as below, per gross ton, f. o. b. cars Birmingham, for the delivery shown, viz.:

For delivery during the remainder of this year and first quarter next:

No. 1 foundry	$14.50 to 15.00
No. 2 foundry	14.00 to 14.50
No. 3 foundry	13.75 to 14.25
No. 4 foundry	13.50 to 14.00
Gray forge	13.25 to 13.75
Basic	14.00 to 14.50
Charcoal	25.00 to 25.50

Charcoal iron is very firm at the prices quoted above, and while no effort is being made to book the production through the whole of next year, contracts to cover the entire first half would probably be accepted at those figures.

Old Material.—Dealers report the maintenance of prices, although the trading in all grades is light comparatively. A contract has just been made for the delivery of 1,000 tons of melting steel in the next three months, which is the only transaction of importance reported for the week. Receipts at local yards have been small for some 30 days past, but with the usual "cleanup" at foundry and furnace plants around the first of the year, it is expected that the tonnage offered to dealers will increase materially. Nominal asking prices for the several grades are about as follows, per gross ton, f. o. b. cars here, viz.:

Old iron axles (light)	$15.50 to 16.00
Old steel axles (light)	15.50 to 16.00
Old iron rails	15.50 to 16.00
No. 1 R. R. wrought	13.00 to 13.50
No. 2 R. R. wrought	11.50 to 12.00
No. 1 country	10.00 to 10.50
No. 2 country	9.00 to 9.50
No. 1 machinery	11.50 to 12.00
No. 1 steel	11.00 to 11.50
Tram car wheels	11.00 to 11.50
Standard car wheels	13.00 to 13.50
Light cast and stove plate	10.00 to 10.50

Announce Reorganization Plan

The stockholders' committee of the Alabama Consolidated Coal & Iron Co., Birmingham, Ala., announced on Dec. 19 the details of the plan it has drafted for the rehabilitation of the property. It provides for an assessment of $30 a share against the preferred stockholders and $15 per share against the holders of common stock. This would furnish a total of $750,000, divided equally between the two classes of stock.

Insure Workmen.—The Shaw-Kendall Engineering Co., the Ensign Foundry Co., J. Nagely and the Corona Cut Glass Co., all of Toledo, O., have taken advantage of the decrease in rates of the state liability board of awards under the workmen's compensation law and insured their employes.

CINCINNATI

Better Feeling in Southern Pig Iron Market

Office of THE IRON TRADE REVIEW,
503 Mercantile Library Bldg., Dec. 23.

Pig Iron.—There is a better inquiry in the market than for the last two or three weeks. This is attributed to the fact that a number of melters have postponed buying for their first half requirements until the last minute, hoping that prices would recede during the holidays, or that they could secure first quarter iron at spot quotations. Also, some users always choose this time of the year to buy, in order to obtain the advantage of securing at least some idea of just what the new year will bring in the way of developments both in the pig iron market and in their own businesses. As a rule, though, most of the manufacturers are taking inventory at present, so as to be able to ascertain the results of the past year before buying too far into the new year.

These recent inquiries, however, are not generally distributed, and are usually for small lots. A number of the dealers report that there is practically no business being done in the way of new inquiries and sales, and that their entire time is being taken up with efforts to have the iron they have sold shipped on scheduled time. Most of them state that they have received more inquiries in the past two or three days than for some time, and that a large number of these are being turned into sales.

Prices in both the south and southern Ohio are unchanged and fairly firm. The recent dull period appears to have had no effect, for although few contracts were closed, the strength of the market was in the fact that shipments on iron already sold were going forward as fast as they could be handled, and also that furnace stocks were being constantly reduced, especially in Alabama, in which state the reduction has been from 230,000 tons to 74,000 tons, or 156,000 tons within the past year. Prices on both Tennessee and Alabama No. 2 foundry iron are $14, Birmingham, for the first quarter, and $14 to $14.50, Birmingham, for the second quarter. A little resale and Tennessee foundry iron is still in evidence at $13.50, Birmingham, but for spot shipment only. In southern Ohio, $17, Ironton, is the general furnace price for No. 2 foundry iron for the first half, with a little resale iron being offered for spot shipment at $16.75, Ironton.

Ohio furnaces have opened their books for the second half on silvery iron on the basis of from $19 to $20, furnace, for 8 per cent silicon, and a recent sale of 500 tons of 7 per cent silicon has been made in southern territory for the last half at $18.50, furnace.

A recent inquiry calls for 500 tons of southern iron for the first half to be delivered into Canada. As a general rule, inquiries are not above 200 tons, but there is one from southern territory for southern iron for 2,000 tons, and another for 1,500 tons, is from a nearby western state. With freight rates $3.25 from Birmingham, and $1.20 from Ironton, we quote Cincinnati prices for the first and second quarters of next year as follows:

Southern foundry No. 1	$17.75 to 18.25
Southern foundry No. 2	17.25 to 17.75
Southern foundry No. 3	16.75 to 17.25
Southern foundry No. 4	16.50 to 17.00
Southern gray forge	16.25 to 16.75
Mottled	16.25 to 16.50
Southern No. 1 soft	17.75 to 18.25
Southern No. 2 soft	17.25 to 17.75
Standard southern car wheel	27.50 to 28.00
Northern No. 2	18.20
Northern No. 3	17.70
Northern No. 4	17.45
Silveries 8 per cent silicon	20.20 to 21.20

Coke.—The inquiry for coke has dropped off considerably within the past week. This does not mean that the demand has weakened, but consumers have begun to realize that they cannot get coke at prices lower than those quoted at the present time, and have, therefore, not continued to seek it in the open market, declaring in some cases that it would pay them to bank their furnaces rather than to pay the figure asked by the ovens. The market is firm and strong, but transactions are light. The outlook for next year is that prices can hardly recede because of the fact that the weather during the month of December has been very good, and production and shipments have been as large as possible under the present conditions, when the serious shortage of labor and equipment is considered. If the weather becomes more disagreeable during the first half, which will probably be the case, both production and shipments are likely to be decreased, which will have a tendency to raise prices. Several of the furnaces in southern Ohio which have contracted for their coke through the first half, are being smothered from time to time because shipments are not coming forward fast enough to supply them. We quote below from the leading coke producing fields as follows:

Connellsville district:	Prompt shipment.	Contract.
Foundry coke	$4.25 to 4.75	$3.75 to 4.00
Furnace coke	3.85 to 4.25	3.25 to 3.50
Wise county district:		
Foundry coke	$4.00 to 4.25	$3.75 to 4.00
Furnace coke	3.50 to 4.00	3.25 to 3.75
Pocahontas district:		
Foundry coke	$3.75 to 4.00	$3.25 to 3.75
Furnace coke	3.25 to 3.75	3.00 to 3.25
New River:		
Foundry coke	$3.75 to 4.25	$3.25 to 3.75
Furnace coke	3.25 to 3.75	3.00 to 3.25

Finished Material.—The local sheet market has stiffened considerably recently and is now very firm at 2.35c for black sheets No. 28 gage, and 3.50c for galvanized sheets No. 28. From the present outlook, it seems that these prices will be considered low by the local mill before the first of the year. Specifications are coming in good on contracts and the mill cannot take any orders for delivery before from eight to ten weeks.

There has been some buying of steel bars and structurals for the second half of next year, and some of the larger makers state that they have practically all of their old customers contracted for this delivery. The prices at which most of the sales were made were the same as those that have been quoted for the first half, namely from 1.40c to 1.45c, for steel bars, and from 1.45c to 1.50c for structurals, both Pittsburgh basis. It has developed also that some business has been taken into the second half of next year, but this is not true of all the larger makers. It is reported that several smaller manufacturers are offering spot business at prices considerably higher than these.

Most of the building material in this district is being sold by the warehouses, but business has been a little slack with this line of the trade during the past week. This condition can be attributed to the cold weather and the holiday trade. No changing in warehouse prices can be expected before the first of the year, if by then.

We quote below warehouse prices, f. o. b. Cincinnati as follows:

Steel bars, 2c to 2.10c base; iron bars, 1.95c to 2.05c base; structurals, 2.10c to 2.20c base; plates, ¼ inch and over, 2.10c to 2.20c base; sheets, blue annealed, No. 10, 2.25c to 2.35c base; rivets, cone head, 2.60c to 2.70c base; cold rolled shafting, 58 per cent discount; steel hoops, 2.10c to 2.20c base; full extras; boiler tubes as follows: 1½ inch, 46 per cent discount; 1¾ to 2¼ inch, 57 per cent discount; 2½ inch, 60 per cent discount; 2¾ to 3¼ inch, 65 per cent discount; 3½ to 4½ inch, 68 per cent discount; 5 to 6 inch, 60 per cent discount; soft steel cold twisted concrete bars, cut to length as follows: ¾ inch square and larger, 2.15c to 2.25c; ⅝ inch square and larger, 2.25c to 2.35c; ½ inch square and larger, 2.35c to 2.45c; 5-16 to ⅜ inch square and larger, 2.55c to 2.65c; and ¼ inch square and larger, 2.65c to 2.75c.

Old Material.—Demand for practically all grades of scrap is at a minimum and dealers do not expect a betterment of conditions until after the first of the year, when there will probably be a better buying movement due to the fact that a number of the larger users have not as yet covered for their requirements for the first six months of 1913. A few of the larger dealers are asking higher prices on several articles, but there have been no sales at these figures. Their object, however, is to have them more generally established by the first of the year. Melters from a southern city have been feeling the market for No. 1 machinery cast and have received quotations all the way from $12 to $14, f. o. b. local yards. This shows in a certain way the quotations at the present time. Dealers are not inclined to add to their stocks and the rural districts are also holding what iron they have in the hope that the new year will bring better prices. Heavy melting scrap has been selling as good as anything at from $12 to $12.50 per gross ton and stove plate the next in proportion at from $18.25 to $18.75 per net ton, but the conditions of the sale generally govern the price. We quote below prices dealers will pay and also dealers' selling prices in Cincinnati and vicinity as follows:

Gross Tons

Old iron rails	$13.75 to 14.25
Old steel rerolling	12.00 to 12.50
Old iron axles	18.25 to 18.75
Heavy melting scrap	12.00 to 12.50
Relaying rails	21.25 to 21.75
Bundled sheet scrap	9.00 to 9.50

Net Tons

Old No. 1 R. R. wrought	$11.25 to 11.75
No. 1 machinery cast	12.00 to 12.50
No. 1 busheling	9.50 to 10.00
Stove plate	8.25 to 8.75
Machine shop turnings	7.50 to 8.00
Cast borings	7.75 to 8.25
Heavy turnings	8.00 to 8.50
Mixed cast	10.00 to 10.50
Malleable	7.75 to 8.25

No. 1 blast furnace of the Pennsylvania Steel Co., at North Lebanon, Pa., has been blown in. Both furnaces in that district are now in operation, as well as the four at Steelton, Pa.

ST. LOUIS

Fair Pig Iron Inquiry Pending

Office of THE IRON TRADE REVIEW,
St. Louis, Dec. 23.

Pig Iron. — The nearness of the holiday season seems to have put a quietus on all branches of the iron industry, and no improvement is expected in the St. Louis territory until after the close of the year. Inquiries are out, none of which are expected to be closed before Jan. 1, for 10,000 tons of northern basic, for first half delivery; 500 tons of No. 2 soft, and 500 tons of northern No. 2, both for delivery over April, May and June, and a number of smaller lots. One sale was made last week of 1,000 tons of 8 per cent northern silicon, and 1,000 tons of low-grade foundry iron. Prices seem to be firm at $14 to $14.50, Birmingham basis, for No. 2; $18, Chicago furnace for northern, and $16.50, f. o. b. Ironton. Our tabulated prices on southern iron, delivered, to which the Birmingham freight of $3.75 has been added, follow:

Southern No. 1	$18.25 to 19.25
Southern No. 2	17.75 to 18.75
Southern No. 3	17.50 to 18.50
Southern No. 4	17.25 to 18.25

Coke.—Very little is doing in the coke line, but prices are firm, and coke is hard to obtain. Our quotations remain as follows:

We quote 72-hour Connellsville foundry grades, $4.50 for immediate shipment or delivery; prompt 48-hour Connellsville furnace, $4.00; contract, $3.25; best 72-hour Virginia foundry, for immediate shipment, $4.25, and for next year, $4.00; 48-hour Virginia furnace, $3.25 to $3.50. The freight to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields when shipment is destined beyond St. Louis.

Old Material.—There is less demand for relaying rails than existed a week ago, and trading seems to have stopped in all grades of scrap. Dealers are not looking for better conditions until after stocktaking. Prices which dealers are willing to pay f. o. b., St. Louis, follow:

Gross Tons

Old car wheels	$15.00 to 15.50
Old iron rails	15.00 to 15.50
Rerol'g rails (5 ft. & ov.)	15.00 to 15.50
Old st'l rails (3 ft. & und.)	14.00 to 14.50
Light section relayers (45 lbs. and under) subject to inspec.	24.00 to 25.00
Relay'g rails, subject to inspec.	24.00 to 25.00
Frogs, switches and guards	13.50 to 14.00
Heavy melting steel	13.50 to 14.00
Shoveling steel	11.75 to 12.00

Net Tons

No. 1 railroad wrought	$12.25 to 12.50
No. 2 railroad wrought	12.00 to 12.25
Arch bars and transoms	15.00 to 15.25
Knuckles, couplers, springs	12.00 to 12.50
Shafting	15.00 to 15.50
Steel car axles	16.50 to 17.00
Iron car axles	20.00 to 21.00
Locomotive tires	13.00 to 13.50
Pipe and flues	8.00 to 8.50
Tank iron and cut boilers	8.00 to 8.50
No. 1 cut busheling	11.00 to 11.50
No. 2 cut busheling	9.00 to 9.50
Cast and mixed borings	7.25 to 7.75
Machine shop turnings	8.75 to 9.25
R. R. malleable	12.00 to 12.50
Agricultural, malleable	10.50 to 11.00
Stove plates	9.00 to 9.25
Angle splice bars (iron)	13.50 to 14.00
Angle splice bars (steel)	12.50 to 12.75

Will Nominate Officers

Nominations of officers of the New England Foundrymen's Association, for the ensuing year, to be acted upon at the annual meeting Jan. 8, are to be made by the committee of three which was named at the December meeting of the association at the Exchange Club, Boston, Wednesday evening, Dec. 11. This committee consists of Messrs. B. M. Shaw, of the Walker & Pratt Mfg. Co., Watertown, Mass.; Henry A. Carpenter, General Fire Extinguisher Co., Providence, R. I., and H. E. Wetherbee, James Hunter Machine Co., North Adams, Mass. A very valuable and interesting report on "Fire Waste in Foundries" was presented before the association by a special committee of three, consisting of Mr. Shaw, Mr. Carpenter and G. P. Aborn. A. F. Murray, of the Blake & Knowles Steam Pump Co., East Cambridge, Mass., presented the discussion of the evening on the subject of "The Air Compressor and Its Profitable Appliance in the Foundry."

Stack Blown In

Birmingham, Ala., Dec. 23.—The Tennessee Coal, Iron & Railroad Co. has relighted another blast furnace at its Ensley works, the stack going in on basic iron.

File Exceptions.—James P. Winchester and Howard T. Wallace, receivers for the Diamond State Steel Co., Wilmington, Del., have filed exceptions to the report of the master, William G. Mahaffey, in the matter of the receivership proceedings in the United States district court. The master criticized the receivers and advised a reduction of some of the claims, hence the exceptions. The time for argument has not been fixed.

NEW YORK

Railroad Business of Year Very Heavy

Office of THE IRON TRADE REVIEW,
1115 West Street Bldg., Dec. 23.

Iron Ore.—Total imports of foreign iron ore to the United States in 1912 will reach about 2,150,000 tons, compared with 1,811,732 tons in 1911, and 2,591,031 tons in 1910. The past year was the second largest in history. As usual, Cuba shipped the bulk of the movement with about 1,450,000 tons. Trans-Atlantic imports as a whole were slightly less than for several years past, though Swedish ore shows some gain by reason of the increased tonnage called for by the long-term Bethlehem Steel Co. contract. The year in the Port Henry district shows a crude ore production of about 800,000 tons, compared with 850,000 tons in 1911 and about 1,000,000 tons in 1910, with shipments from 576,000 to 700,000 tons, compared with 740,000 tons in 1911 and 860,000 tons in 1910. The eastern ore market at present is very quiet.

Pig Iron.—The holiday quiet is squarely upon the pig iron market in the metropolitan district and in surrounding territory. Probably not more than 2,000 tons of various grades are now under negotiation for delivery during the first and second quarters. A New Jersey consumer is asking for 300 to 600 tons of malleable for second quarter and another buyer in the same territory for 500 tons of No. 2 plain for first quarter. A Brooklyn inquiry for 500 tons of No. 1 has been withdrawn. A railway equipment maker who is figuring tentatively on 500 tons of additional iron, finds it will not need this metal. A car builder in the Boston district has closed for 500 to 1,000 tons of various grades for shipment over the first half. Prices are firm and generally display no softness. It is apparent there is considerable tonnage of low and off-grade metal in the market upon which some buyers will accept small concessions to move.

Northern foundry No. 1	$18.75 to 19.00
Northern No. 2X foundry	18.50 to 18.75
Northern No. 2 plain	18.25 to 18.50
No. 2 Virginia	18.80 to 19.00
No. 2 southern foundry	18.50 to 18.75
Malleable	19.50 to 20.00
Gray forge	17.50 to 17.75

Ferro-Alloys.—There is not much demand for first half ferro-manganese as buyers are well covered nor is there much available unsold material for that delivery. Carload sales for first quarter have been made at $69, seaboard, but some material is available for this period around $65. The first half range now appears to be $65 to $70, seaboard. Spot ferro is selling at from $4 to $6 a ton above this price. The last half market continues $65, seaboard. Inquiry is light at present in ferro manganese as well as other alloys.

We quote standard English 80 per cent ferro-manganese at $73 to $75, seaboard, for early shipment, $70, seaboard, for first half and $65 for second half; 50 per cent ferro-silicon on contract at $75, Pittsburgh or Philadelphia, for carloads, $74, for larger lots, and $73, for 600 tons or more.

Plates. — The Harriman Lines put out formal inquiries Dec. 19, for an aggregate of about 12,000 freight cars, representing one of the largest single inquiries of the year. Hoppers, gondolas, box and other types are called for and about half the total number are of the box design. This keeps the total number of cars building at about 50,000. The Cambria Steel Co. will furnish the 1,000 hoppers recently ordered by the Baltimore & Ohio and the Barney & Smith Car Co. shared in the award of additional cars last week by the Norfolk & Western. Some independent sellers of plates in the Pittsburgh district which were taking third quarter and last half contracts at 1.45c to 1.50c, Pittsburgh, are now selling ahead less actively, having booked considerable tonnage. Eastern makers continue to book new business freely at 1.60c to 1.65c, Pittsburgh, or 1.76c to 1.81c, New York, but do not care to contract beyond the first quarter. An export inquiry for 10,000 tons of plates from the British Isles is current. Plates continue to be quoted at 1.45c to 1.50c, by Pittsburgh makers, but those companies which were offering plates for third quarter and last half at these prices, are now less active in the market.

We quote, delivered at New York tidewater, for first quarter, 1.76c to 1.86c New York, on sheared plates. Some makers are asking $1 higher for universal plates. On third quarter and last half contracts, Pittsburgh district, makers are quoting 1.61c to 1.66c, New York.

Structural Material.—There has been some rush by the railroads and other buyers of fabricated steel to close up matters which have been pending for some time before the end of the year and small lettings, especially in bridge work, are numerous. The total of all of these, however, is scarcely more than 2,000 tons. The Boston & Maine railroad has placed a bridge at Mechanicville, N. Y., 150 tons, with the Pennsylvania Steel Co.; another at West Valley Falls, N. Y., 350 tons, with the McClintic-Marshall Construction Co. and three additional bridges requiring less than 100 tons with the King Bridge Co.; L. F. Shoemaker & Co., have 360 tons for a Philadelphia & Reading pier at Philadelphia; Belmont Iron Works, 350 tons for signal bridges for the Pennsylvania railroad; the Virginia Bridge & Iron Works will furnish 750 tons for the Raleigh, Charlotte & Southern, which was recently reported as having gone to another fabricator. Jones & Laughlin have 250 tons for the Naumkeag Steam Cotton Co., Salem, Mass. The New York, New Haven & Hartford is inquiring for four bridges to require about 500 tons. No award has yet been made on the addition to the Marshall Field store, Chicago, 12,000 tons, but final action is expected to be made any day. The American Bridge Co. has furnished all the steel for the present buildings of this store. Wm. P. Seaver is the low bidder for the bridge improvements to the Manhattan bridge, this city, 1,200 tons, bids for which were opened this week. The government took bids this week on 400 tons for shipment to Hawaii. It is believed by some of the leading structural makers that the enormous subway and elevated extension requirements in greater New York, especially that portion for the Brooklyn Rapid Transit Co., which has been pending for some time, will be placed with the mills by Feb. 1. The total requirement for this work is estimated at from 300,000 to 400,000 tons and even higher by some authorities.

Eastern makers continue to quote structural shapes at 1.60c, Pittsburgh, or 1.76c, New York, with deliveries running around three months or more on sizable lots. Pittsburgh shapemakers are virtually out of the market for six months.

We quote for New York delivery for first quarter as follows: Structural shapes, 1.66c to 1.76c. On third quarter and last

half contracts, Pittsburgh district makers are quoting 1.61c to 1.66c New York.
Structural shapes from store, 2.15c.

Semi-Fnished Steel.—Heavy inquiries for billets and sheet bars for English consumers continue to come out, one lot of 20,000 tons and another for a larger tonnage which appeared recently, being still before sellers. American makers would probably have little difficulty in getting from $26 to $27 mill for this business but they have little free steel to offer.

A large steel maker has closed for 15,000 tons of southern billets for shipment to an eastern plant. Such shortages of steel among steel makers are not of uncommon occurrence. Prices of billets are very strong.

We quote for New York delivery, steel bars on contract from 1.56c to 1.61c and common iron bars at 1.65c to 1.70c. Steel bars from store are quoted at 2.05c.

Iron and Steel Bars.—Some important independent makers who have been selling steel bars for third quarter and beyond to the larger consumers at an unchanged schedule of 1.40c to 1.45c, Pittsburgh, are not so aggressive in this policy. Iron bars continue strong in price and in good demand.

Cast Iron Pipe.—Atlantic City took bids the past week on 1,200 tons, Boston will close on Dec. 27, on 7,000 tons and Detroit is out for 3,800 tons to close Jan. 14. The cast iron pipe market has continued very active especially in private buying and prices are steadily increasing in strength.

We quote six-inch pipe at from $24 to $26, f. o. b. New York, in carload lots.

Rails and Track Materials. — Rail makers enter the new year with an almost unprecedented tonnage upon their books which in some high circles is believed to be around 3,000,000 tons. Some independent mills have fully six times the tonnage they had one year ago. The Delaware, Lackawanna & Western has placed 1,000 tons of girder rails with the Pennsylvania Steel Co. It develops that an order for 30,000 tons of open hearth rails, placed several weeks ago by the Canadian Pacific railroad, will be furnished by the Lackawanna Steel Co. The Buenos Ayres & Pacific railroad has placed an order in this country for 10,000 tons of Bessemer rails.

Old Material.—Conditions in scrap materials are quiet as consumers have been receiving such heavy quantities on shipment recently that many of them are wholly out of the market. New orders are not of large extent. An embargo at Perth Amboy continues and as a result there is an absence of a local demand for borings and turnings in this market. Heavy melting steel in small lots is bringing from $14.50 to $14.75, delivered eastern Pennsylvania, but on tonnages for forward shipment, the minimum of the market is about $15.25, delivered. We quote, gross tons, prices New York dealers will pay at tidewater, as follows:

Old car wheels	$13.50 to 13.75
Old iron axles	22.00 to 22.50
Steel axles	17.00 to 17.50
Old steel shafting	16.50 to 17.00
No. 1 heavy melting steel	12.25 to 12.50
No. 1 R. R. wrought	14.25 to 14.50
Wrought pipe (not galvanized)	11.00 to 11.25
Cast borings	8.75 to 9.00
Machine shop turnings	8.75 to 9.00
Heavy cast	12.00 to 12.50
Stove plate	9.25 to 9.50
Grate bars	8.25 to 8.50

Freight rates on scrap per ton to Steelton, Pa., Columbia, Pa., Pottsville, Pa., and Harrisburg, Pa., are $1.50 from Jersey City, and $2.00 from New York; to Coatesville, Pa., Ivy Rock, Pa., Phoenixvile, Pa., and Reading, Pa., $1.50 from Jersey City, and $1.80 from New York; to Bethlehem, Pa., $1.10 from Jersey City, and $1.60 from New York; to Roebling, N. J., $1.00 from Jersey City, and $1.50 from New York; to Milton, Pa., $1.60 from Jersey City, and $2.00 from New York; to Jersey City, $1.00 from New York; to Newark, $1.10 from New York

BUFFALO

Little Decrease in Business Due to Holidays

Office of THE IRON TRADE REVIEW,
Buffalo, Dec. 23.

Pig Iron.—The placement for the week amounted to fully 30,000 tons of all grades, but a considerable portion of this was in charcoal iron. Surface indications show a quiet market, but under this there is a marked degree of activity. The customary seasonable letting up on account of the holidays and the inventory period is only slightly apparent. Customers who at this time of the year have been in the habit of asking to have shipments deferred have taken the opposite position and are anticipating shipments. Pressure of business is causing inventories to be postponed or put off entirely. One of the largest users in the territory says inventory will have to be taken on the run and that this plant can see nothing ahead but 100 per cent capacity until Jan. 1, 1914. Furnaces are shipping to the limit of their capacities, but are not gaining on the demand. Open weather has tended to minimize the car shortage situation, by affording the railroads an opportunity to catch up. Prices f. o. b. Buffalo are substantially as follows:

No. 1X foundry	$17.50 to 18.25
No. 2X foundry	17.25 to 18.00
No. 2 plain	17.25 to 17.75
No. 3 foundry	16.75 to 17.50
Gray forge	16.50 to 17.25
Malleable	17.25 to 18.00
Basic	18.00 to 18.25
Charcoal	18.25 to 19.25
*Some grades and brands	22.00

Finished Material. — Prices remain rigid, there is little inquiry in the market, due to the knowledge of the sold up condition of the mills, and specifying continues to be decidedly heavy in volume. The latter comes from the consumers desiring to take advantage of tonnages contracted for at prices better than those prevailing, but getting their full amounts on the mill books before the end of the year. While some of the mills have slightly improved the delivery situation, it has grown worse with others. The only new business being considered is that of old contract customers, and even such orders are only being accepted "at mill's convenience." Prices hold firmly at 1.40c to 1.45c, base, on shapes and plates. Some of the smaller eastern mills are obtaining 1.60c to 1.75c, for structural on promise of nearby shipments, but these producers are now being forced to extend deliveries to three months and over.

The Lackawanna Bridge Co. was low bidder on the steel for J. P. Devine Co.'s new plant, Buffalo, requiring about 2,000 tons. Bids were opened today for the new city hall, Geneva, N. Y., requiring about 150 tons.

Old Material.—The holiday slowup has settled upon the scrap market, even though hardly apparent in the other branches of the metal trade. The activity of the week was limited in practically all lines, with the exception of heavy melting steel, the demand from out of the district buyers slightly raising the prices on this material. The range for the week, for gross tons, f. o. b. Buffalo, is substantially as follows:

Heavy melting steel	15.00 to 15.50
No. 1 railroad wrought scrap	15.25 to 15.75
No. 1 R. R. and mch. cast sc'p	13.50 to 14.00
Old steel axles	15.75 to 16.50
Iron axles	23.25 to 23.75
Car wheels	16.00 to 16.75
Railroad malleable scrap	13.25 to 13.50
Wr'ght iron and soft steel turn.	8.75 to 9.00
Cast iron borings	8.00 to 8.50
Low phosphorus steel scrap	16.75 to 17.25
Old iron rails	15.00 to 15.50
Tank iron	10.25 to 10.75
Boiler plate, sheared	14.50 to 15.00
Pipe and tank	10.00 to 10.50
Stove plate	11.25 to 11.75
Sheet iron	7.75 to 8.25
Locomotive grate bars	11.25 to 11.75

It is reported from Tulsa, Okla., that the molders employed by the Oklahoma Iron Works, that city, have struck because their demands for an increased wage scade and shorter hours were refused.

EASTERN MINES

Not Sustained in Complaints as to Rates on Iron Ore.

The eastern iron ore miners have lost in their complaint against the freight rates they pay on the product of their mines in northern New Jersey and southeastern New York to the furnaces of the Lehigh and Schuylkill districts of eastern Pennsylvania. They have also lost in their complaint on the rate from Keenes, N. Y., to Wharton, Pa.

While the complaints were against the rates themselves, in reality the complainants were contending that their rates were too high in relation to the rates from Buffalo and Port Henry, N. Y., to the eastern furnaces. The Interstate Commerce Commission found that, considering the density of the tonnage from Buffalo and the water competition from Port Henry via Lake Champlain, rates are not too high. The commission points out that with one exception, from two to five carriers participate in the hauls from the complaining mines while from Buffalo, the transportation is a one-line haul, and that the most circuitous route involves only a two-line haul. In addition there is a return tonnage—anthracite coal—while the movement from the eastern mines produces a large amount of empty car mileage.

The commission found, however, that the rates are not well adjusted. For instance, the rate from Fort Montgomery to Wharton is $1.20 for 125 miles. Coatesville and Pottstown have the same rate from Ringwood, but they are not placed on a parity with shipments from Wharton or from Fort Montgomery. The commission suggests that the rate from Fort Montgomery seems too high when compared with the Ringwood rate to Pottstown. The commission thinks there should be a readjustment of the rates, but it does not suggest absolute adherence to a mileage system of making them.

The commission expects the carriers to make these readjustments and therefore, includes a table of rates some of which are higher and some of which are lower than those now in effect.

The Interstate Commerce Commission in announcing a decision in the case of the Cahill Iron Works, of Chattanooga, Tenn., against the Southern and other railroads, has just held that the rate of $2.20 per 100 pounds on cast-iron, porcelain-lined, combination sink-and-laundry tubs from Chattanooga to San Francisco, when shipped in mixed carloads with sinks, is unreasonable. A rate of $1.40 was ordered to be put in effect by Jan. 15.

PLANS FOR SELLING

Properties of Southern Iron & Steel Co. on Jan. 31.

Details regarding the proposed sale of the Southern Iron & Steel Co., Birmingham, Ala., have been agreed upon, and the order of sale announcing that the assets of the concern will be sold at public auction, Jan 31, at noon, has been drawn up. The sale will take place at the Third avenue entrance of the Jefferson county court house and the results will be reported by Trustee James Bowron, on Feb. 1, to Referee F. H. Dryer, before whom the bankruptcy proceedings have been conducted.

The referee orders that the properties shall be sold as a going concern. On account of liens and other incumbrances, an offering will be made in four separate parcels first and then as a whole. The minimum price for the free assets of the concern has been fixed at $500,000, and a limitation of not more than 50 per cent of principal and interest accrued to bankruptcy has been placed upon the margin of proofability of mortgage funds after exhaustion of security. Attorney Van Brunt, representing the reorganization committee, has returned east to report. It is generally believed that the reorganization interests will buy out the properties.

Coke Prices Tending Upward

Pittsburgh, Dec. 24. (By wire.)—That prompt furnace coke will be firmly established at $4.25, ovens, immediately after Christmas is the opinion of some of the most conservative producers and dealers in the district. Talk of spot coke going at $4.25 is heard in the trade. It is understood that a couple of lots sold late yesterday at that figure. Several consumers advise that it is improbable that contracts will be closed at less than $3.50, ovens, for the first half of 1913.

Upon the petition of receivers of the Wilmington Wheel Co., Wilmington, Del., Chancellor Charles M. Curtis has granted an order for the sale of unfinished stock to an association of wheel manufacturers in that section. The stock was purchased at cost prices.

METAL MARKETS

Chicago

Dec. 23.

New Metals.—Notwithstanding the season of the year, the market for new metals in this territory is a little stronger. Seasonal dullness maintains to a certain extent, however, and some active buying is expected after the first of the year.

We quote dealers' selling prices f. o. b. Chicago as follows:

Lake copper, carload lots, 17½c; casting, 17⅜c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 7¼c; lead, desilverized, 4.25c; sheet zinc, 9c, f. o. b. Lasalle, in car lots of 600-pound casks; pig tin, 49.97c; Cookson's antimony, 10½c; other grades, 9½c.

Old Metals.—The usual inactivity at this season is reflected in the market of the old metals and very few changes in price schedules have been made.

We quote dealers' selling prices f. o. b. Chicago, as follows:

Copper wire, crucible sheets, 17c; copper bottoms, 14½c; heavy red brass, 13¼c; heavy yellow brass, 10¼c; No. 1 red brass borings, 12½c; No. 1 yellow brass borings, 9.25c; brass clippings, 10½c; lead pipe, 4½c; zinc scrap, 5½c; tea lead, 4c; No. 1 aluminum, 20c; No. 1 pewter, 36c; block tin pipe, 47c; tin foil, 40c; linotype dross, 3½c; stereotype plates, 4c; stereotype dross, 3.50c; prime slab zinc dross, $131 a ton.

Belgium Leads in Per Capita Pig Iron Consumption

The development of the metallurgic industry in Belgium has been such that that country is now the largest per capita consumer of pig iron in the world, consuming annually 738.5 pounds of pig iron per inhabitant, while the United States comes second with 650.4 pounds, says a consular report. Next in order of importance are Germany with 482.8 pounds, England with 447.5 pounds and France with 242.5 pounds.

As regards steel, Belgium occupies second place with an annual consumption of 418.9 pounds per capita, in contrast to the United States' consumption of 617.3 pounds per capita; Germany follows Belgium with 396.8 pounds, England comes next with 308.6 pounds, and then France with 196.2 pounds.

Larger Terminals Needed to Avert Disaster

James J. Hill in Address at New York Says Railways of Country Must Have Greater Facilities — Deserve Public Confidence

James J. Hill, in a speech before the Railway Business Association gathered in annual dinner at New York a few nights since on "The Country's Need of Greater Railway Facilities and Terminals," said in part:

"The commerce of the country can escape disaster only by additions to and enlargements of terminals. Between 1909 and 1910 freight ton mileage grew 11 times as fast as trackage, and five times as fast as equipment. When the railroad yards are filled with cars that cannot be moved, the railroad loses a portion of its earnings; but the business man loses a larger share of his trade, and the workingman his employment.

"The public assumes that if enough cars are provided they can be moved on schedule time from point of origin to destination, wherever these may be. This is not the real trouble. What is really needed is the greater movement of cars. There is but one possible remedy—enlarged terminals.

How Can Capital be Obtained?

"The main question back of that is financial. Large sums of money must be raised. What security can the railroads offer? Many of them have not only pledged their credit to the limit, but have absorbed a large share of their surplus earnings that in other countries would have been paid out in dividends. Gross revenues grow, but expense grows faster. During the first seven months of 1912 operating revenues increased 3.3 per cent per mile as compared with the same period in 1911; operating expenses increased 4.9 per cent and net operating revenue decreased 0.5 per cent. The additions to taxes and other incidental expenses will raise this figure.

"Ten or 15 years ago 4 per cent would bring in capital for railroad improvements. The rate has advanced from 1½ per cent to 2 per cent in little more than 10 years. The railroads can pay money only as they are permitted to earn it. It is up to the people to say whether or not these terminals and other facilities shall be supplied; just as it is up to them to suffer the severest of the consequences if they are not.

"Two questions arise. The first is, 'Why are the railways not now in a position to borrow the money and build the terminals at once?' The second is, 'What have the railways done to entitle them to confidence, to relief and to a more fair and generous treatment by the public?'

Credit Impaired

"The impairment of credit has come from decreased earning power and increased expenses. Rates have steadily declined. The average freight rate per ton mile fell from 9.27 mills in 1890 to 7.53 in 1910. While revenue was shrinking, obligatory expenses have increased enormously. Employees decreased in 1911 by 29,611 as compared with 1910, while wages increased by $64,741,164. In 1890 taxes aggregated $31,207,469; in 1910, $103,795,701; for 1911 they are estimated at $109,000,000, and may be a couple of millions more. The increase in 20 years is 233 per cent. Each mile of line paid $199 in taxes in 1890, and $431 in 1910.

"The railroads of the United States are entitled to both confidence and relief because they have not abused their trust in the matter of capitalization. While, to make possible the raising of money, stock-bonuses undoubtedly were given in their earlier history, it is true of them as a whole today that they have by far the smallest capitalization per mile in the world; and that they have kept their capitalization low by using for betterments millions of earnings which in Europe would have been handed over to stockholders, leaving the cost of improvements to be charged to capital account. Probably $60,000 represents about the average actual capitalization today. This figure is to be compared with the capitalization per mile in other countries as follows: United Kingdom, $275,040; England alone, $314,000; Germany, $109,788; France, $139,237.

Entitled to Confidence

"The railways are entitled to confidence and relief because they have displayed efficiency. The figures already given show an increase of traffic in a year about five times as great as the increase of equipment and 11 times the increase of mileage. Yet the machine has been hauling its load because efficiency has been developed. Heavier rails, larger engines, cars of greater capacity, increased train movement and the full utilization of equipment have kept business moving. The density of traffic in England, France and Germany should be as much greater than in the United States as the density in the middle exceeds that in the far western states. Yet the ton miles per mile of road are: France, 496,939; United Kingdom, 529,622; Germany, 827,400; United States (1910), 1,071,086.

"They have shared their gains liberally with the people through rate reductions. It has become common to think of the progressive lowering of rates, while all other charges are rising, as the work of legislative compulsion. On the contrary, many of the most important reductions made in the past were voluntary.

Regulation vs. Strangulation

"The country cannot rise to the level of its duty or its opportunity until the scientific knowledge of the expert and the action of the just judge are applied to the settlement of economic issues. The American people must soon begin to realize how injuriously they are themselves affected by a game that has been played for so many years with their business prosperity and their future welfare. The people must realize that regulation must not be strangulation."

Prominent steel men were among those in attendance at the annual dinner. Those who were present included E. H. Gary, of the United States Steel Corporation; C. M. Schwab, of the Bethlehem Steel Corporation; Alba Johnson, of the Baldwin Locomotive Works, and others.

At the annual election of officers of the association, which preceded the dinner, the following were chosen: President, Geo. A. Post, of New York; vice presidents, A. M. Kittredge, Dayton; W. E. Clow, Chicago; G. W. Simmons, St. Louis; S. P. Bush, Columbus; Alba P. Johnson, Philadelphia; A. G. Prout, Pittsburgh, and W. G. Pearce, New York; treasurer, Charles A. Moore, New York; assistant treasurer, M. S. Clayton, New York.

IMPORTANT PRINCIPLES

Involved in Decision by the Interstate Commerce Commission.

Washington, Dec. 24.—The Interstate Commerce Commission has passed upon the vexatious and long-standing dispute as to mine ratings for the 168 coal mines on the Illinois Central, of which 114 are local to its lines, 45 are junction point mines which have other railroad connections and nine have outlet by rivers. These mines are spread over a territory 461 miles long and 226 miles wide in Illinois, Indiana and Kentucky. Most of them are small, but the principles enunciated in the decision are of great importance to mine operators.

In the controversy the Illinois Central contended that the rating should be based solely upon shipments previously made by way of that line. In that contention the railroad company was supported by the operators whose mines are exclusively served by the Illinois Central. Operators of junction point mines served by the Illinois Central and other railroads insisted upon ratings based upon the hourly capacity of each mine.

The commission holds that the ratings shall be based upon the hourly capacity for production; that the mines that have outlet by river shall be treated as junction point mines; and that upon days for which the junction point mine orders no cars from another carrier it shall have its full rating on the Illinois Central.

New York Metal Market

Dec. 23.

Copper. — The copper market has remained irregular in prices and transactions have been of light volume during the past week. The moderate amount of business done ranged between 17.30c, cash for electrolytic and 17.50c. Sales at these figures represented resale lots of copper, of which offerings are becoming scarce, as is indicated by the higher price being established at the end of the week. Leading sellers have not changed these quotations from 17.75c delivered 30 days for electrolytic, 17.75c to 17.87½c for lake, and 17.50c for casting. The London standard market displayed more strength and closed today at £75 15s for spot and £76 17s 6d for three months. Exports of copper since Dec. 1, are 18,834 tons.

Tin.—Consumers have been active buyers of tin since Dec. 17. It is estimated that upwards of 1,000 tons of the metal has been contracted for in the outside market during the week. In some cases the delivery dates ran into February, indicating staunch belief in a continuation of good business in manufactured articles during the first quarter of 1913. Sales of spot and December tin were made today at 50.32½c, and January at 50.20c.

The London market closed strong at £228 7s 6d for spot and £228 12s 6d for three months.

Arrivals since Dec. 1, aggregate 2,213 tons and there are 2,231 tons afloat.

Lead.—The demand for lead improved somewhat, but offerings have been liberal and depressed the price below last week's level. Shipments covering the next three months are easily obtainable at 4.25c in New York from independent sellers.

Spelter.—A light volume of business has been done at from 7.25c to 7.35c in New York, for December spelter, and 5 points lower for future positions up to March.

Antimony. — Pressure to sell has brought about a lower range of prices of the best brands of antimony. Cookson's is 10.12½c to 10.25c. Hallett's is 9.50c to 9.62½c. Other brands are from 9c to 9.25c.

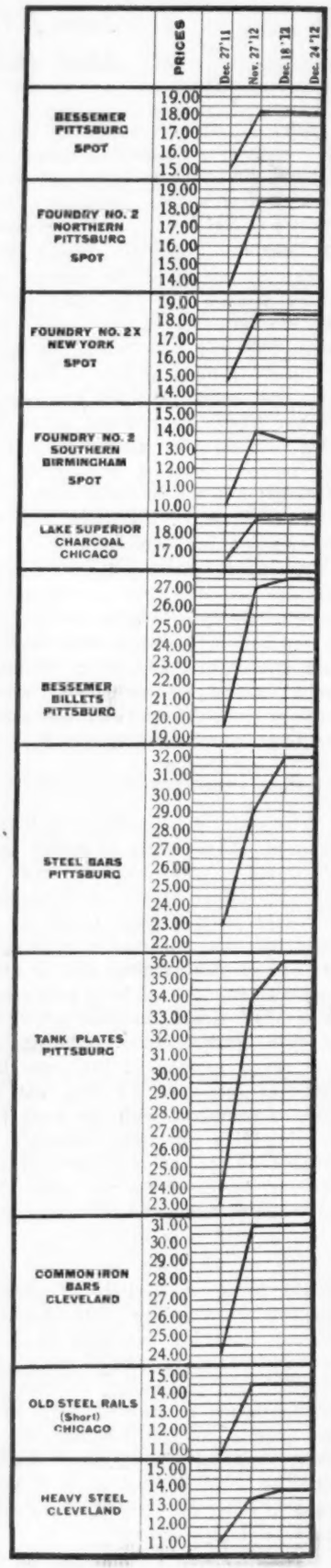
Revised Discounts on Boiler Tubes

A revised list of discounts on steel boiler tubes, effective Jan. 1, has been issued. The changes in net prices are not important, but in most cases show advances.

NET PRICES ON STEEL BOILER TUBES

Size, inches.	Old list, cents.	Old discount, per cent.	Old net price, cents.	New list, cents.	New discount, per cent.	New net price, cents.	Change in net price, cents.
1¼	22	62	8.36	22	61	8.58	+ .22
2	20	62	7.60	20	61	7.80	+ .20
2¼	24	62	9.12	22	58	9.24	+ .12
2½	28	64½	8.52	28	64	10.08	+1.56
2¾	34	69½	10.37	31	64	11.16	+ .79
3	35	69½	10.68	34	69	10.54	— .14
3¼	40	69½	12.20	40	69	12.40	+ .20
3½	44	72	12.32	43	71	12.47	+ .15
3¾	50	72	14.00	47	71	13.63	— .37
4	55	72	15.40	55	71	15.95	+ .55
4½	62	72	17.36	62	71	17.98	+ .62
5	75	64½	26.62	76	64	27.36	+ .74
6	100	64½	35.50	102	64	36.72	+1.12

PRICE CHART



Forging Steel Axles by a Steam-Hydraulic Press

Description of the Carbon Steel Co.'s Axle Manufacturing Process—Bottom-Poured Ingots and Heat-Treating Methods

The methods of manufacturing steel axles for locomotives, freight and passenger cars, to a large extent, have been standardized and vary only in minor details. The steel customarily is forged into axles by a drop hammer, after which it is heat-treated and rough-turned on a lathe. The Carbon Steel Co., Pittsburgh, recently has made extensive changes and improvements in its axle manufacturing department. In place of employing hammers for forging, a steam - hydraulic press is used. Acid steel only is utilized for the manufacture of axles, but the plant is well-equipped to manufacture either basic or acid steel, as the melting department is provided with eight 50-ton open-hearth furnaces which may be lined for producing either grade of steel. When manufacturing steel for axles, the charges are reduced to 25 or 35 tons, as it has been found that in smaller sized heats a better distribution of the elements in the mixture can be obtained. The charges consist of the best obtainable grades of pig iron, high grade scrap and return scrap from the company's various departments.

To eliminate segregation and piping as far as possible, and to obtain a close, dense grain, the ingots are bottom-poured, the molds being set on plates and are grouped around a central runner. In Fig. 1 the pouring basins leading to three runners are shown at *A*, with the ingot molds grouped around them ready to receive the steel from the ladle. The molds are connected to this runner by sprues, which are formed by runner brick below the level of the plates on which the ingot molds are set. The interior of the large central runner is lined with sand which is dried by gas. The steel is conveyed from the open-hearth furnace to the ingot molds in a ladle, from which it is poured into the pouring basin leading to the runner. The steel flows simultaneously into the molds connected with a common runner, oxidation and the spattering of the steel thereby being reduced to the minimum. After casting, the ingots are cooled slowly, special care being taken in cold weather to prevent chilling. This, it is claimed, is a further aid in obtaining a close-grained structure. After having been cooled, the ingots are charged into the soaking pits, after which they are transferred to the universal mill for rolling into blooms. In the rolling process, the ingot which has a coarsely granular structure, is carefully treated to prevent the formation of internal or external fractures. The first pass effects only a slight reduction in the size of the ingot and the succeeding passes are gradually increased to insure the formation of a close, tough grain in the steel. In breaking-down the ingot, the number of passes is four or five times as great as ordinarily employed in a blooming mill. After every second pass the ingot is quarter-turned and the discard is sufficiently ample to remove all defective steel.

FIG. 1—METHOD OF GROUPING INGOT MOLDS AROUND A CENTRAL RUNNER FOR BOTTOM-POURING

After the ingot has been rolled to a section 11 inches square, the blooms are sheared to the required length and are charged into a heating furnace, illustrated in Fig. 3. The blooms are heated slowly and uniformly so as to obtain an even distribution of the heat throughout the section. The furnace illustrated in Fig. 3 is gas-fired and was designed especially for this work by the company's engineers. It is of the regenerative type, 24 feet long, 8 feet wide and 3 feet. 6 inches high at the point where the arch begins to spring. It is provided with four sets of doors, located opposite each other to accommodate exceptionally long blooms or billets. The checker-

FIG. 2—THE OPEN-HEARTH FURNACE CHARGING FLOOR

work extends 6 feet, 6 inches below the level of the ground and is divided into two parts by a brick partition. When the gas is turned into one side of the furnace, the flame passes over the furnace hearth through the down-take ports into one portion of the checkerwork and out of the flue. When the checkerwork on one side has become properly heated, the gas is turned into the opposite end of the furnace and the current is reversed so that the other portion of the checkerwork may become heated. This furnace has a capacity for heating 75 tons of billets and blooms daily.

After the blooms have attained the desired forging temperature, they are shaped on a steam hammer and subsequently are finished into axles by a high speed, steam-hydraulic press, built by the United Engineering & Foundry Co., Pittsburgh, and illustrated in Fig. 6. It is claimed that the squeezing action of the press permits the metal to flow into its new form in such a way as to insure uniformity of structure and an almost entire absence of internal strains. According to the German government specifications, forgings made from rolled or hammered steel must have

FIG. 3—THE LARGE, GAS-FIRED FURNACE FOR HEATING BILLETS AND BLOOMS, WHICH SUBSFQUENTLY ARE TO BE FORGED

FIG. 4—AXLE, HEAT-TREATING FURNACE, SHOWING ELECTRICALLY-OPERATED BUGGIES IN THE FOREGROUND

an initial section at least eight times that of the finished section, while those made from pressed steel need have an initial section only four times that of the finished section.

After cooling, the axles are heat-treated, which is one of the most important steps in the axle manufacturing process. The furnace used for heat-treating is illustrated in Fig. 4. It is of the muffle type, 10 feet wide, 30 feet long and 54 inches high. The doors are raised and lowered hydraulically, the furnace being of the regenerative type. The forgings are placed on trucks operating on rails and shown in front of the furnace, Fig. 4. These trucks are electrically-operated and are run into the furnace to deposit the axles on the furnace bottom. The forgings are heated slowly to the proper temperature, after which they are quenched in oil. The forgings again are charged into the furnace for reheating, after which they are permitted to cool slowly before being removed. This treatment not only is designed to refine the grain, but also is intended to eliminate all internal strains.

To determine the results obtained by the heat-treating process, the Carbon Steel Co. selected, at random,

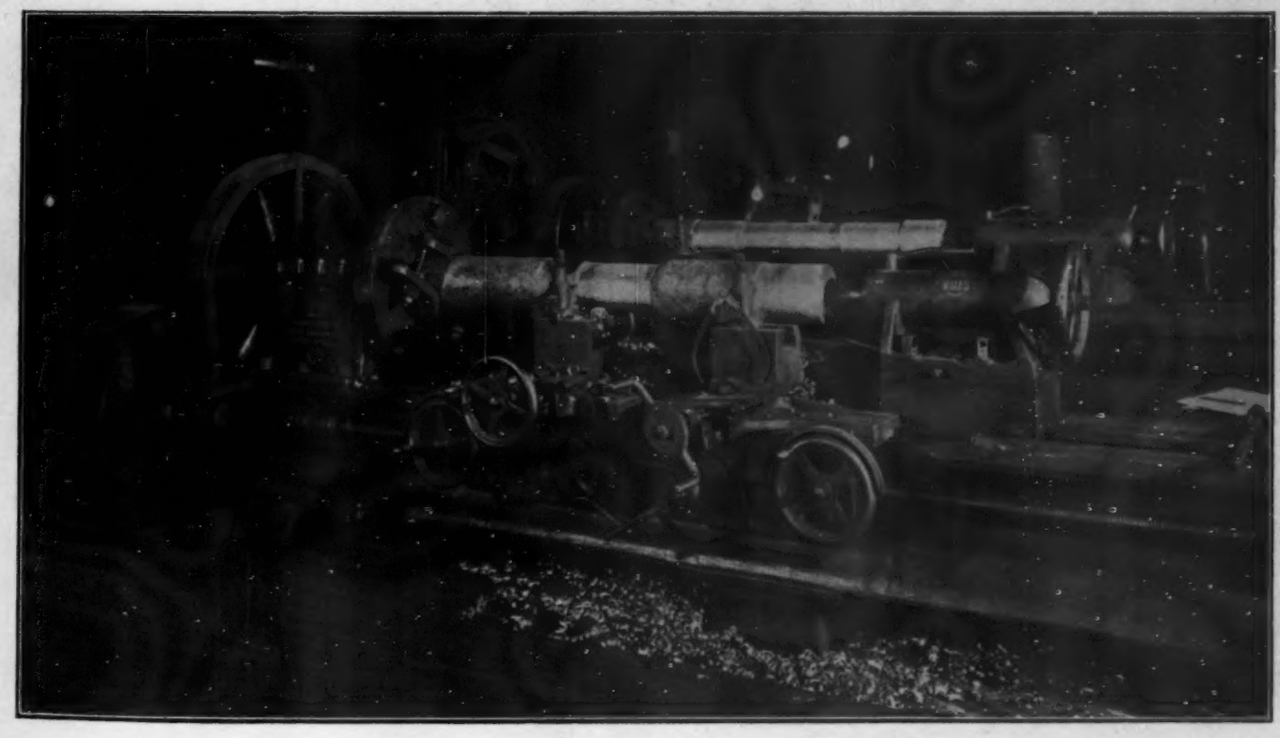


FIG. 5—LATHES FOR ROUGH-TURNING STEEL AXLES

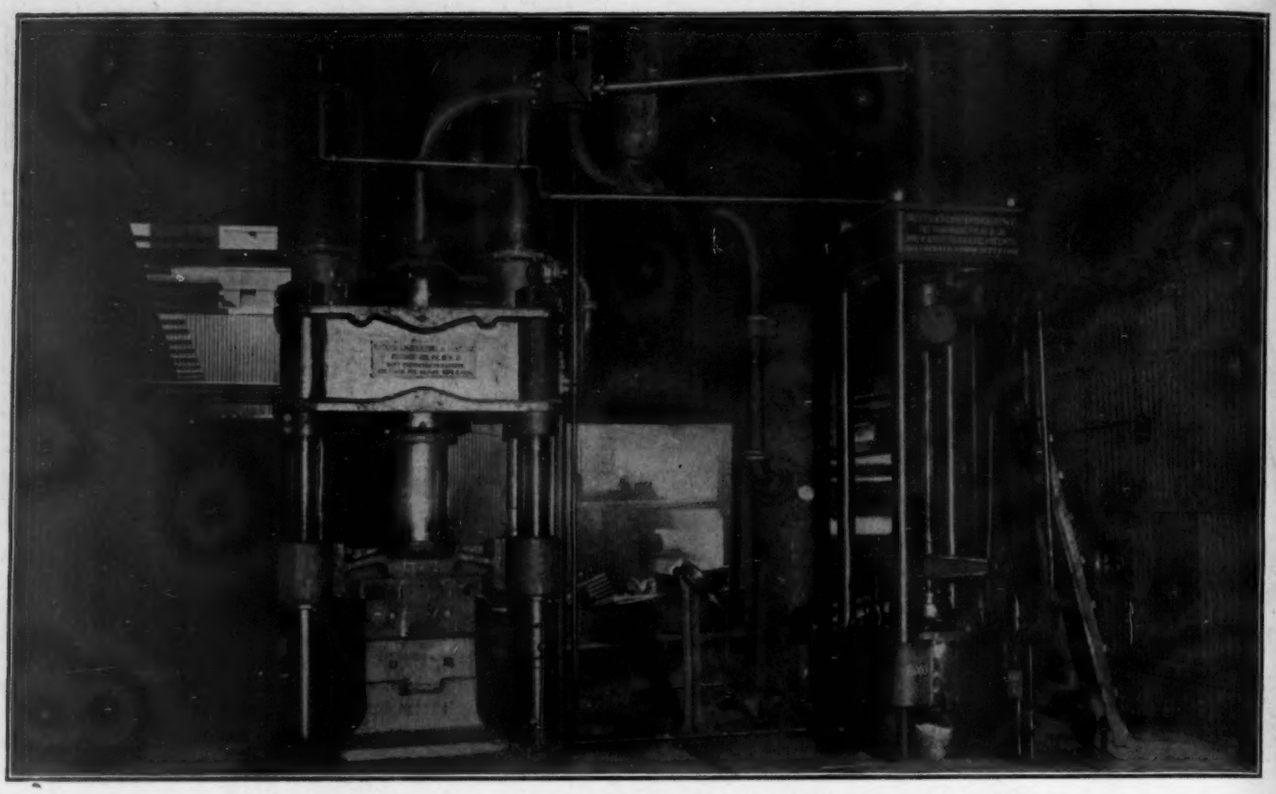
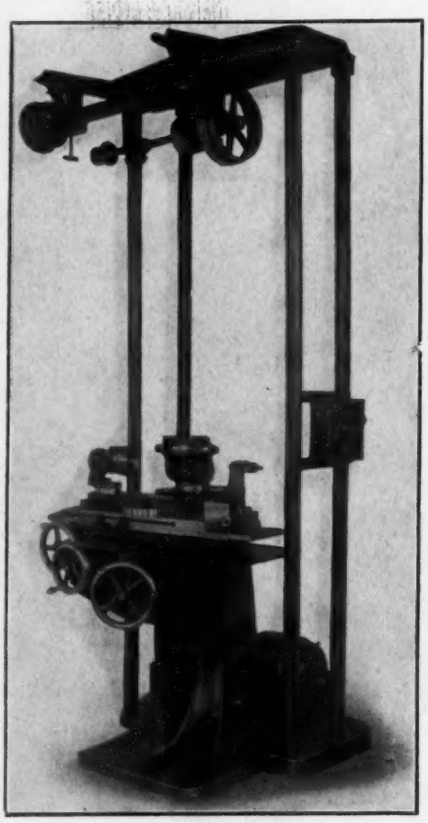


FIG. 6—HIGH SPEED, STEAM-HYDRAULIC PRESS FOR FORGING STEEL AXLES

three axles, one as it was received from the hammers, another after annealing and a third after it had passed through the heat-treating process. After cutting slots longitudinally in the ends of the forgings, they were split throughout their length. The forged axle prior to the heat-treatment showed a coarser grain than after the annealing or heat-treating process. This fracture, however, indicated a refinement of the grain as a result of the previous work. The fracture of the annealed axle showed that the forging strains had been eliminated and the grain was slightly finer than that of the axle which had not been heat-treated in any way. The heat-treated axle had an exceedingly fine grain, far superior to that of the other two axles, and the physical tests indicated that this axle was of superior quality. Following the heat treatment, the axles are rough-turned with an allowance of ⅛ inch on the surface for finishing. The collars, however, are left in the rough-forged condition. Fig. 5 shows two of the lathes and it will be noted that two cuts are being taken simultaneously on each axle.

In addition to axles, the Carbon Steel Co. manufactures all kinds of forgings for locomotives, steel billets and bars, die blocks, fire-box, boiler and tank steel, universal mill plates and special grades of tool steel.



MOTOR-DRIVEN CUTTER AND TOOL GRINDER

Motor Drive for Tool Grinder

An exceedingly novel method of applying motor drive to a No. 2 universal cutter and tool grinder, built by the Oesterlein Machine Co., Cincinnati, is shown in the accompanying illustration. The upright supports for the shafting and hangers are located at the rear of the machine, so as not to interfere with cutting or grinding operations. The base on which the motor is mounted is a cast iron frame to which are attached the four steel pipe supports for the countershaft plate, which likewise is made of cast iron. The equipment is simple and can be applied economically to similar tools.

During the last 15 years, a remarkable advance has been made in hydro-electric development in Switzerland. The pioneer plant of this kind was established at Schaffhausen, on the Rhine river, in 1863, and the first plant built on modern lines was placed in operation at Heerbrugg, in 1887. In 1911, there were 783 electric power plants in operation in Switzerland, of which 473 purchased power from other plants and resold it, generating no energy themselves. Of the establishments generating their own power, 233 were wholly or partially hydro-electric stations and the remaining 77 were steam or gas plants.

The Significance of Oil Engine Developments[1]

Both Large and Small Units Are Now Being Built, Which Are Designed to Operate With Low Grade Fuel

By W T Price[2]

The first internal combustion engine was invented by Lenoir in 1860. This burned gas at atmospheric pressure and, of course, was hopelessly inefficient. The four-cycle principle of operation was developed by Beau de Rochas, in 1862, and was re-invented by Dr. Otto in 1876. This four-stroke cycle, which has been used for so many years, promises to continue the popular internal combustion engine cycle for many years.

Four-cycle or four-stroke cycle implies that it requires four strokes to complete the cycle of operation. This distinguishes it from the two-stroke cycle. On the first stroke the charge is drawn into the cylinder through the admission valve. On the next stroke the charge is compressed and toward the end of the stroke it is ignited. The pressure then rises and the piston goes forward on the working or expansion stroke, at the end of which the exhaust valve opens, the pressure drops and the piston starts back on the exhaust stroke. This expels the burned gases and leaves the cylinder free to receive a fresh charge. While the De La Vergne Machine Co. has installed a large number of gas engine plants, the demand for the oil engine has reached such proportions that it greatly surpassed the requirements for the gas-driven machine with this company. In Germany, a similar change from the gas to the oil engine is now taking place.

The gasoline engine appears more closely related to the oil engine than the gas engine, but actually it is merely a gas engine with a carburetor placed in its suction pipe. The function of the carburetor is to distribute the gasoline to the incoming air. With the present high price of gasoline, manufacturers are building a modified gasoline engine which, though often called an oil engine, should be termed a distillate engine. The exhaust pipe is jacketed so that after the engine is started on gasoline, and the exhaust pipe has become hot, the incoming air may be drawn through the jacket and heated. The heated air enables the carburetor to vaporize distillates heavier than gasoline, such as kerosene, gas oil, 38-degree distillate and other light petroleum fractions. Another type is arranged so that the distillate is itself pre-heated by the exhaust.

This type will seldom burn the fuel oil which is the refuse from the refinery, and a standard commodity, and further, it has the gasoline engine's disadvantages of electrical ignition and carburetor with the added one of increased cylinder carbonization.

Some distillate engines are arranged so that water is admitted to the cylinder to improve combustion, but this requires very careful adjustment and unless distilled water is used, carbonates of lime, etc., may accumulate and cause serious wear to cylinder and piston.

Another type of distillate engine is the two-cycle, crank case compression,

[1]From a paper presented at the December meeting of the Philadelphia Foundrymen's Association.

[2]De La Vergne Machine Co., New York City.

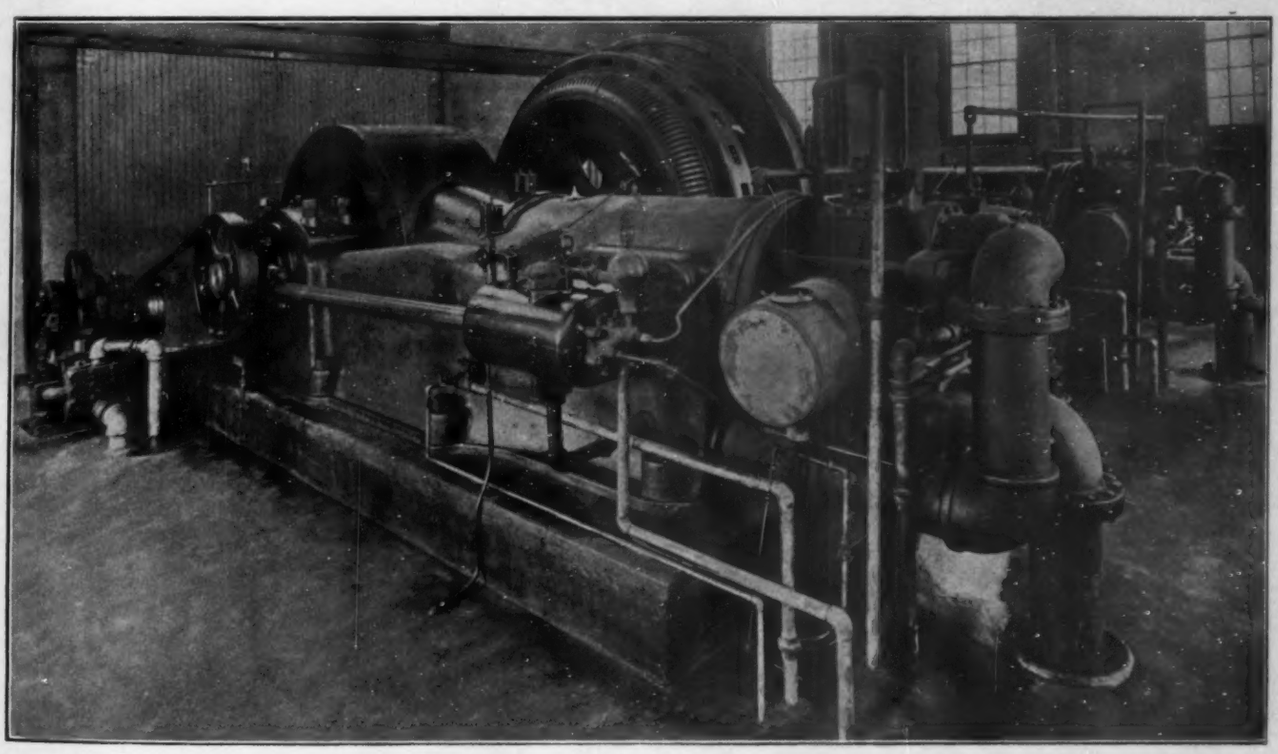


FIG. 1—TWIN-CYLINDER, 400-HORSEPOWER, DE LA VERGNE, F. H. TYPE, OIL ENGINE, DIRECT-CONNECTED TO ALTERNATOR FOR ELECTRIC FURNACE WORK

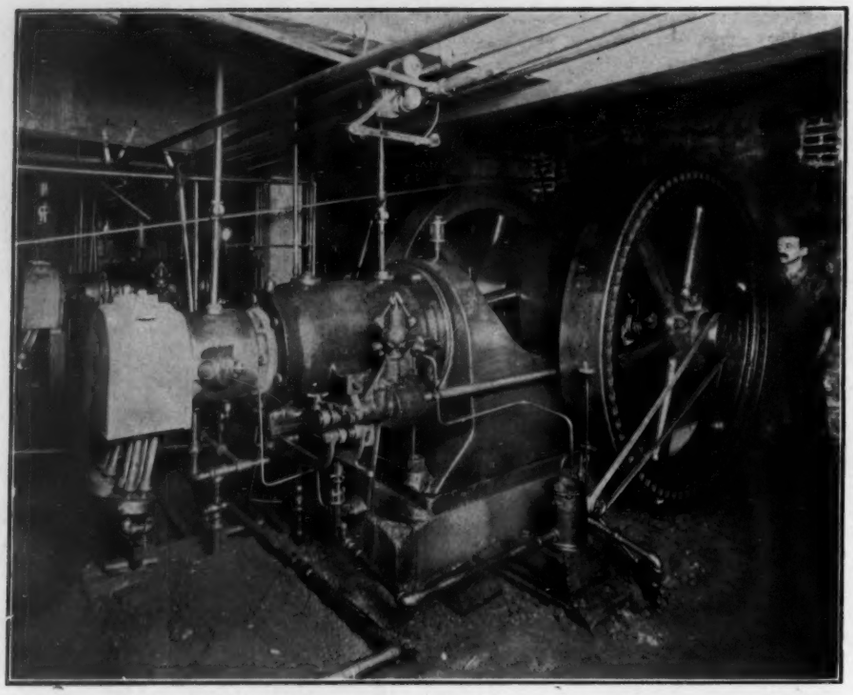


FIG. 2—TWO 50-HORSEPOWER, DE LA VERGNE, H. A. TYPE, OIL ENGINES

hot cap machine. Before starting, the cap is heated by a torch. On the working stroke, air is compressed in the crank case to a pressure of about five pounds. Toward the end of the working stroke, the exhaust port is uncovered by the piston and an instant later, the scavenging port on the other side is also uncovered and the air from the crank case is supposed to sweep in and expel all the products of combustion. The compression stroke follows and at its end, the oil is jetted against the hot cap and ignited.

The main trouble is that the combustion, necessarily imperfect, takes place in the cylinder and carbon is deposited over piston rings, cylinder walls and in the exhaust ports. The scavenging is incomplete; on account of the low efficiency of the crank case as a compressor, the volume of air which enters the cylinder for scavenging is only about one-half the volume to be displaced. It is about one-third the amount necessary for good scavenging and results in merely diluting the burnt charge with air. However, for motor boats, house lighting sets and other intermittent service work, this engine has a field of usefulness. The De La Vergne, Hornsby-Akroyd oil engine operates on the four-stroke or Beau de Rochas cycle, but it differs from gas engine operation in that only air instead of a mixture is drawn into the cylinder on the suction stroke, the oil at the beginning of the stroke being injected in several fine streams into the vaporizer.

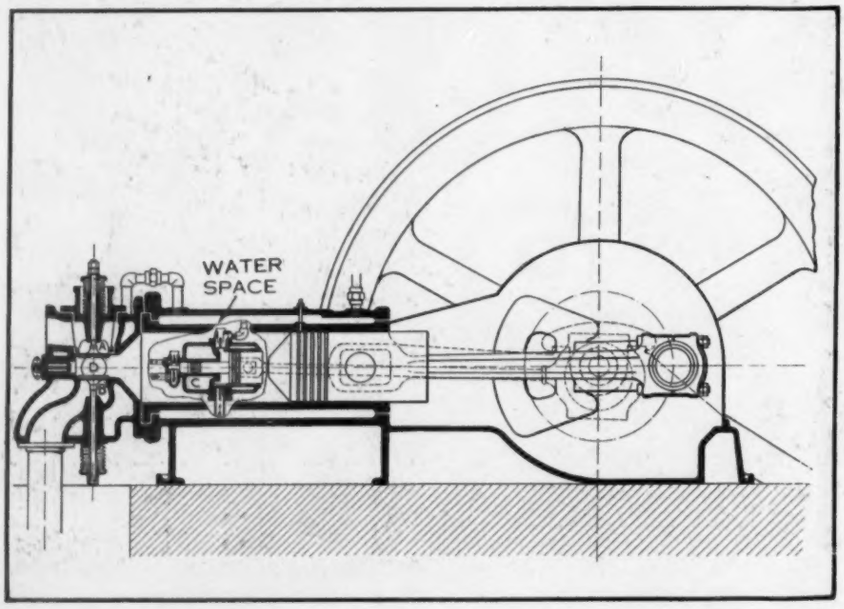


FIG. 3—LONGITUDINAL SECTION OF DE LA VERGNE, HORNSBY-AKROYD, OIL ENGINE

This chamber is connected to the cylinder by a small neck. The cap is heated with a torch before the engine is started and afterward is kept hot by the combustion in the cylinder. At the end of the suction stroke, there is a charge of air in the cylinder and a charge of oil vapor in the vaporizer. The piston returns on the compression stroke, forcing the air through the small neck into the vaporizer. During this stroke, three changes are taking place: The oil vapor is being made ignitable by the air mixing with it; the mixture is becoming hotter by contact with the hot cap and the temperature is being raised still higher by the compression. These three causes culminate in an ignition at the desired instant. The elimination of electrical ignitors or other ignition devices is one of the reasons for the dependability of this type of machine.

The Vaporizer

Another feature is the vaporizer, in which all combustion takes place. When the oil is burned without injection by compressed air, there is necessarily a certain deposition of carbon. The vaporizer retains this deposit and once or twice each week the cap is unbolted and a lump of carbon is removed. This engine will operate not only on kerosene and distillates, but also on most of the regular fuel oils.

About seven years ago 42 units of 125-horsepower, single cylinder, 27½ x 33-inch, Hornsby-Akroyd engines were purchased from the De La Vergne Machine Co. by the Baldwin Locomotive Works. Twelve were installed at the Fifteenth street plant, Philadelphia, six at the Seventeenth street plant, Philadelphia, 10 at the Eddystone and 14 at the Standard Steel Works, Burnham, Pa. These engines have given good service, but it is safe to say that no more Hornsby-Akroyd engines of such large size ever will be built. The combustion is not so good as in the smaller sizes, and furthermore, an engine of this size justifies a more complicated and more economical type. This engine now is built in sizes from 12 to 50 horsepower, single cylinder, and 50 to 100 horsepower, twin-cylinder.

In the small sizes it is an extremely economical engine, not entirely on account of low fuel cost, but also on account of the small amount of attention required. With engines of about 50 horsepower, not more than 1½ hours' attention per day is necessary.

Installations of 50-horsepower, De La Vergne, Hornsby-Akroyd oil engines, are shown in Figs. 2 and 6. These engines operate on approximately one pound of kerosene, distillate or regular fuel oil per brake horsepower hour.

In 1893, Rudolph Diesel, of Munich, Germany, conceived the principle of carrying the compression to such a point that the temperature caused by that compression would be sufficient to ignite the oil atomized into it by air at still higher pressure. He also planned to regulate the injection of fuel so that the pressure would not rise above the maximum compression pressure. The Diesel engine met with immediate success in Europe and was brought to this country in 1897. Unfortunately, however, it did not receive the high degree of workmanship and attention required by such an engine and the trouble which ensued retarded oil engine building in the United States for a number of years. It is only fair to state, however, that some good engines of this type have lately been built and quite a few of these plants are now giving good service in this country.

Economies of De La Vergne Oil Engines

The De La Vergne-Franchetti engine has the same economy as the Diesel type at full and three-quarters loads and slightly better economy at lighter loads. Its chief advantage, however, is that it operates at lower pressures. It is a compromise between the Diesel type and the Hornsby-Akroyd. It has the air injection and the general timing of the former, while it retains the vaporizer of the latter, which enables it to ignite the oil at a pressure of 280 pounds, about half that of the Diesel type.

The principle of operation is as follows: The admission valve opens and the piston moving forward draws in a charge of air; the piston returns and displaces all the air from the cylinder, compressing it to a pressure of about 280 pounds in the space between the two valves and out into the vaporizer. At that instant, the spray valve is opened mechanically and the oil is projected across between the two valves into the vaporizer. The pressure rises to the highest possible point and the expansion or working stroke begins. At the end of the working stroke, the exhaust valve opens. The pressure then drops and the piston returns, sweeping out the burned gases. The exhaust valve then closes and the admission valve opens. With this principle, pre-ignitions are impossible as the combustible is not introduced until the time for ignition arrives.

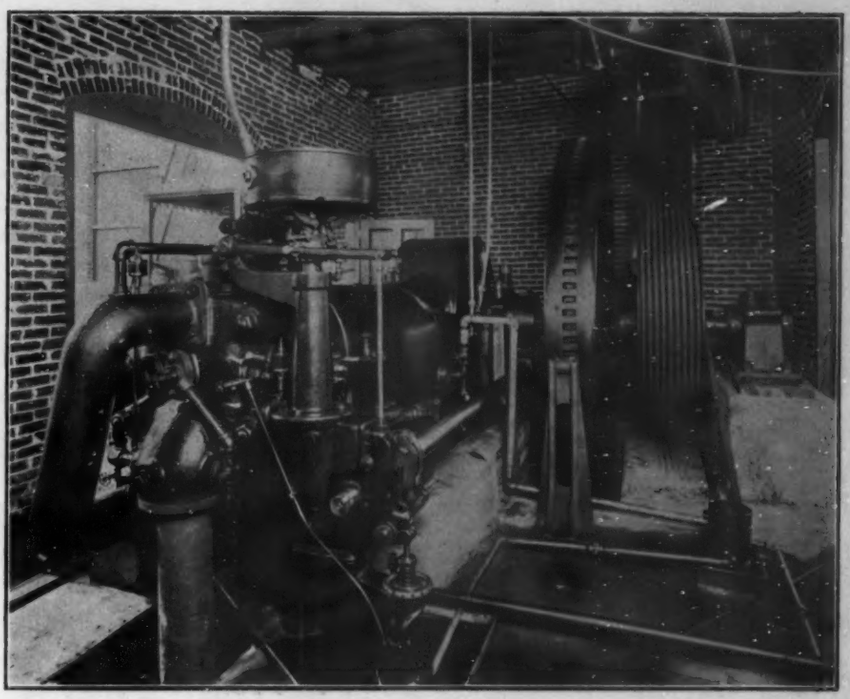


FIG. 4—DE LA VERGNE, F. H. 90-HORSEPOWER OIL ENGINE, WITH ROPE DRIVE

The air for the oil injection comes from the small two-stage compressor on the back of the engine and as the compression against which the oil is injected is only 280 pounds, 600 pounds pressure of injection air is sufficient. With the Diesel type, the injection air must be at 1,000 pounds or more on account of the higher compression pressure.

In starting, the vaporizer is heated with a torch and since the temperature of this chamber is itself sufficient to ignite the fuel, the compression can be reduced and the engine started on 100 pounds of air pressure. This starting pressure is supplied from the first stage of the air compressor.

Another important feature of this type is that it is particularly adapted

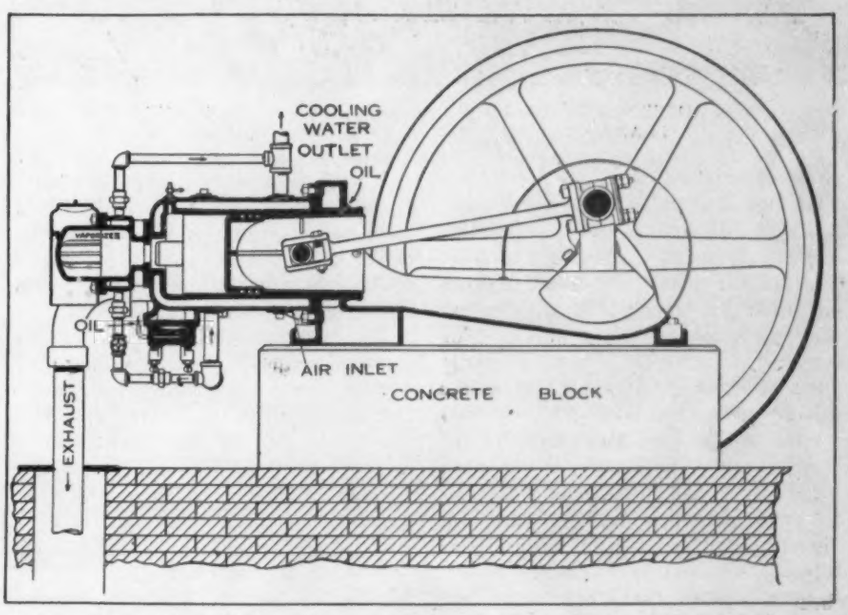


FIG. 5—LONGITUDINAL SECTION OF DE LA VERGNE F. H. OIL ENGINE

to burn the heavy oils which are being used more generally. If there is anything in the oil that cannot be consumed instantly, it will adhere to the vaporizer and will gradually burn away or it will pass out of the exhaust valve without fouling the cylinder.

Future Fuel Oil Supply

I am frequently asked about the future supply of fuel for the oil engine. Those who are least concerned are the oil producers and others familiar with the oil situation. The important fact is that we can afford to burn oil in the oil engine at a higher price than it can be used for other purposes. I am acquainted with a number of oil consumers who will discontinue the use of that fuel in their furnaces because the recent advance in price makes it too expensive. At present the De La Vergne Machine Co.'s power plant is being operated on water gas tar, which is a cheap coal by-product from gas works. This can be obtained in almost all large cities and can be purchased at a low price.

In Germany a large quantity of coal is coked, and the coke is used for heating operations, while the tar is fractioned, providing tar for the chemical industries and tar oil for internal combustion engines. It has been calculated that the tar production of Germany is sufficient, if used in oil engines, to furnish power for the entire navy and for all its industrial plants as well. The same system of treating the coal, in due time, will appear in this country.

In Fig. 1 is shown a 400-horsepower De La Vergne-Franchetti engine, installed in the plant of the Crucible Steel Casting Co., Lansdowne, Pa., direct-connected to a generator which delivers current to a Rochling-Rodenhauser induction furnace for steel refining. The unit, Fig. 4, has a capacity of 90 horsepower and is in operation at the plant of the Salisbury Worsted Mills, Camden, N. J.

A 720-horsepower, 4-cycle, horizontal engine recently has been designed by the De La Vergne Machine Co. and will be built shortly. The valve gear of this engine has been so designed that one eccentric operates the four valves of two cylinders. The engine consists of two pairs of cylinders with the flywheel interposed.

The 400-horsepower, twin-cylinder engine installed by the Crucible Steel Casting Co., Lansdowne, Pa., is direct-connected to an alternator. This plant furnishes current to a combination induction, 2-ton furnace, of the Rochling-Rodenhauser type, which displaces the present crucible furnaces. This installation makes possible the change of the heat energy in the oil to motive power, then to electric power and then back to heat energy in the metal with a consumption of only one-third the fuel used directly in the crucible furnaces. Furthermore, there is an additional saving of no small amount due to the elimination of crucibles. It is evident that the oil engine is an ideal prime mover for electric furnace work.

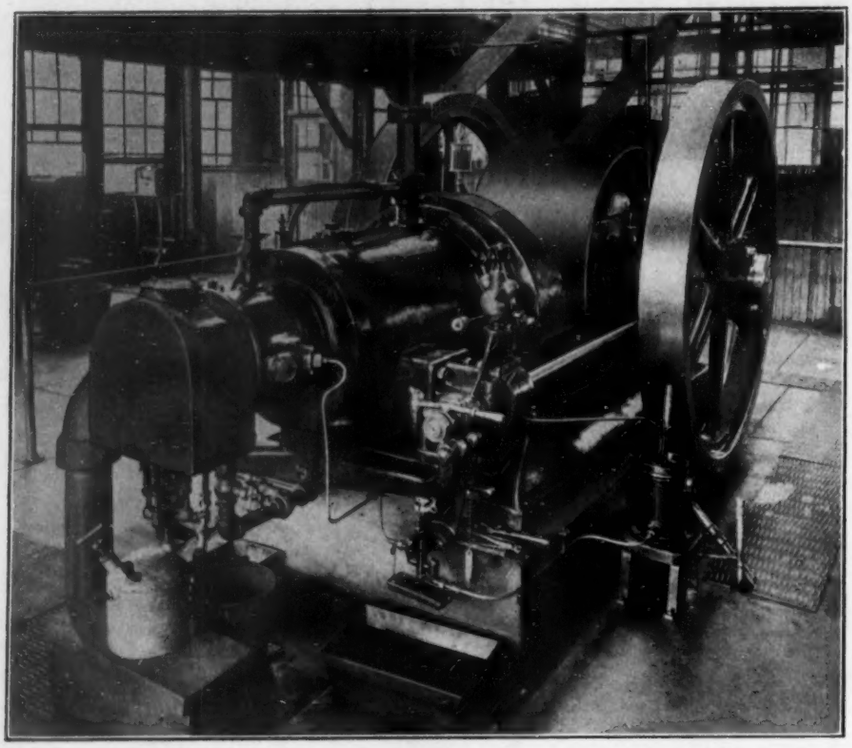


FIG. 6—A 50-HORSEPOWER, DE LA VERGNE, H. A. TYPE, OIL ENGINE AT THE PLANT OF C. R. CARVER CO., PHILADELPHIA

Increasing Use of Motor Trucks

The use of motor trucks is extending much more rapidly than is generally appreciated, and in this connection the following percentages of increases in various localities are interesting: In Massachusetts, during one year, registrations increased 62½ per cent; Washington, D. C., nearly 100 per cent; Los Angeles, 1,700 per cent, and Chicago, 120 per cent. It is estimated that 50,000 trucks are in use in this country at present, and if the rate of increase is maintained this number probably will be doubled during 1913. Although owners of smaller establishments are rapidly coming to use these power vehicles, special activity is noticeable among the larger concerns, such as express, contract delivery and transportation companies, foundries, machine shops, steel plants, storage warehouses, coal companies, etc. As an example, the Adams Express Co. is now operating 485 motor wagons in different cities, the American Express Co., 352, and together, the five leading express companies have 968 in service. Other large users are: New York Edison Co., 104; Western Electric Co., 63, and the Burns Bros. Coal Co., New York City, which is using 21 10-ton coal trucks.

To keep pace with the demand, a larger number of sizes is now offered by the manufacturers, especially from 500 pounds to 5 tons capacity. A large number of new models also is being made in the 1,500-pound, 1-ton and 3,000-pound capacity machines. Many of the latest models of trucks embody such features as self-starters, demountable and automatic dump bodies, left steer and center control, and spring-supported power plants.

Most of the manganese ore consumed in this country is imported from Brazil, India and Cuba, smaller amounts being obtained from Russia, Germany, Great Britain, Belgium, Japan, the East Indies and other countries. A considerable amount of high grade foreign ore is used in the manufacture of dry cells for electric batteries. Most of the domestic manganese ore is used in making brick and pottery, as a coloring material, or for other chemical purposes.

Sampling Iron Ore at Lake Superior Mines

A Discussion of the Inadequate Methods Generally Pursued, With Suggestions for Improving Ore Sampling

By Benedict Crowell

At the present time, to ship 100,000 tons of ore, and to have the average result of the producers' and consumers' chemists check by 0.1 or 0.2 per cent in iron is not considered conclusive evidence of good sampling. It is now necessary for each cargo to be taken as a unit and the producers' and consumers' samples of each individual cargo must check closely. Pig iron is now more closely graded than in 1904; furthermore, it is bought and sold on specifications that allow such small variations in silicon and manganese that the exact analysis of each cargo of ore must be known. This has resulted in more careful sampling at the consumers' end. But the consumers' analyses and the lower lake chemists' analyses are often received too late to be of value to the furnaceman. Some of the ore from a cargo is often in the furnace before the entire cargo is unloaded. For this reason the mine analysis of each cargo must be used by the furnaceman, and it must be correct.

At the present time many methods of sampling are in use. Each mine has had its own particular problem and has worked it out in its own way, until today many methods and modifications of methods are in use, some of them good and some of them bad.

Present Sampling Methods

There are four places underground where samples are generally taken.

First.—Faces of Ore in Place. These are generally sampled by the shift bosses, and at many mines no regular method is used for this sampling. Pieces are broken off the face here and there, often by candle light. If seams of rock run through the face, little or none of it is put into the sample. Some shift bosses reason that rock is thrown out before the ore is loaded and should, therefore, not be represented in the sample. Undoubtedly such are the orders, but such orders are not always carried out.

Second.—Piles of Ore After Blasting Down. These piles are sampled by the shift bosses in various ways, by moving around the pile, taking pieces at intervals, by sizing up the proportion of lump and fine and taking five or six pounds of ore in such a proportion; or by taking handfuls here and there, mostly fine ore which is the more convenient to pick up.

Third.—Stopes and Chutes. A very common practice in sampling ore from a stope is to take the sample from the chute below just before loading a car. This generally means taking handfuls of ore, mostly fines, for seldom is a hammer used. If the samples are taken in the stope, it is by picking from the piles of broken ore, or in some cases, breaking samples off the faces of ore. In any of these conditions it is seldom that a correct proportion of lump and fine is obtained, and sometimes no attempt is made to keep such a proportion in the sample. When the lump and fine ore are approximately of the same analysis, this does not, of course, make much difference. But there are many ores in which the lump contains appreciably more iron than the fine, and vice versa.

Fourth.—Skip and Mine Car Samples. These samples are generally taken by the skip tender and are supposed to be representative of the ore hoisted for a day, or a shift. They are, of course, continuous samples. A certain amount, varying in different mines from a pinch to a handful, is taken from the top of each car or skip. The ore so taken is generally thrown into a box. The contents of this box are mixed at the end of the day, or shift, and the sample represents the ore hoisted during this period. It is no wonder that these samples are unsatisfactory.

Pocket Samples

Pocket samples are usually taken at the chute on surface as the ore is run from the pockets into the railway cars. They are generally taken by the lander, whose main duty is to load the cars. The lander usually lets each skip load run through the pocket into the car, without filling the pocket, and holds a shovel in the stream of ore long enough for the shovel to fill. In this way he gets a shovelful of ore to represent the skip load. He then takes a part of the shovelful and places it in a box. At the end of the shift he has a box full of ore to represent the hoisting during that shift. Sampling such as this is open to the same objections as skip sampling, and it is nearly impossible to get proper percentage of lump and fine into the sample.

Car samples are taken from the surface of each railway car after the car is loaded and before it is hauled away from the mine. At some mines this sample is taken by the lander. He samples the car as best he can, when his other duties will permit. He is generally supposed to use his judgment as to the proper proportion of fine and lump ores to put into his samples. In other mines the car sampling is given the attention of trained samplers. These samplers show all stages of proficiency and get varying results. Some use no tools, some of them use a scoop or trowel, and a few use both scoop and hammer. Some measure the distances properly, others guess the distance, and still others take the samples haphazard. These samples usually weigh from five to ten pounds per car. They are sent to the laboratory in boxes, each box marked with its proper car number. These samples are sometimes analyzed separately, and sometimes grouped into units of five or ten cars for analysis.

Cargo Sampling

Cargoes of ore are now considered units, and the main object of sampling, at the mine, dock and furnace, is to get a correct sample of each cargo of ore. Underground samples and daily output samples are valuable aids to the miner, but are of secondary importance. Sampling the ore in the vessel while loading has not been successful. The nearly universal practice of Lake Superior mines is now to sample the railway cars at the mine, in groups of from one to ten cars, and with these car analyses, and a list of the car numbers loaded into each cargo, to calculate the analysis of the cargo. This method has proved fairly satisfactory in the past, and will always prove satisfactory, if the car

[1]Presented at the Houghton meeting of the Lake Superior Mining Institute, Aug. 28-30, 1912.

sampling is well done, and the sample truly represents each carload. If the car samples are incorrect, the cargo analysis must be incorrect.

Advantages of Uniform Methods of Sampling

There are two reasons why accuracy in sampling is essential:

First.—That the seller of the ore may receive his just due.

Second.—That the user may go about the reduction of the ore to pig iron in an intelligent manner.

The calculation of a blast furnace burden is dependent on the analysis of the material to be used in the furnace. If the analysis of a certain ore gives one result at the mine, another result at the lower lakes, and still another result at the furnace, the furnace manager must necessarily be uncertain of just what the ore actually contains, and must allow a wide enough variation in his calculation to take care of the difference. If, in the final analysis, that of the furnace, the results show lower iron than was paid for, the seller at once receives a complaint. If the yield is higher, possibly not much is said, but the seller has failed to receive his just due.

It is very desirable and essential that the analysis be as near correct as possible. Analytical work has been standardized until, at present, the various constituents of an iron ore can be determined accurately, at least within narrow limits of errors. If the sample is not representative, then the analytical work, however accurate it may be, is of no practical value. The thing to do then is to standardize the sampling so that the sample will be representative. It is obvious that no method can be devised which can be used at mine, lower lakes, and furnace, but I believe a particular method can be found, applicable to each of these places. This has been done at the lower lakes, is slowly being brought about at the mines, and is being agitated at the furnace.

Underground Sampling

The ore should be sampled in a vertical face, if possible. The broken ore may be caught in a powder box or on a canvas spread on the ground so that it will catch all of the ore broken from the face. If the ore is hard a hammer and moil, or gad, should be used to break it. A sampling pick is objectionable, since the point of a pick always tends to follow the softer parts of the ore, thus getting an undue amount of softer material in the sample.

The sample should consist of all the ore broken or chipped from a groove cut straight across the formation, at right angles, or nearly so, to the dip. The groove should not be less than 1 inch deep and 2 inches wide, and should extend clear across the face of the ore sampled. Several of these grooves may be necessary. This depends upon the size of the face, and whether the ore is mixed or fairly clean. Experience alone will demonstrate the number of cuts necessary for a given size of face in any mine.

If the ore is soft and uniform, use a sampling pick. The groove should be 2 inches deep and 4 inches wide. If the ore is mixed, a hard ore mixed with soft rock, or soft ore containing layers of hard lean ore or rock, make a wider cut, using moil and hammer, being careful to keep the groove uniform in size.

Broken Ore

If the ore has been blasted and is lying at the bottom of the drift, or stope, begin at any convenient spot on one side of the pile and draw a line across the middle of the pile. Then from either end of the pile measure one hammer length along the line, and at this point take one scoopful of ore, if fine ore is found at this point. If lump ore is encountered here, break off enough lumps to equal in bulk one scoopful. Then measure another hammer length along the line, and take an equal bulk of whatever is encountered at that point, and so on across the pile. This will usually give a fair sample of a uniform ore. If the ore is mixed and requires a larger sample, draw two or more parallel lines across the pile and sample as described. The more variable the pile the more difficult it is to sample and the larger the sample should be. As soon as the sample is taken, the lumps should be broken down to about ½ inch size. Then mix thoroughly and quarter, rejecting the two opposite quarters. The sample should be reduced to 8 to 10 pounds in size, by alternate crushing and quartering.

The object of all sampling done by the skip tenders, landers, etc., is to get a fair sample of the output of the ore during a unit of time, usually a day or a shift. These samples are continuous, that is, a small quantity is taken from every mine car, or skip, and these portions are mixed to represent the output during the time specified. I suggest that these continuous samples be omitted entirely, and the daily output be gaged by samples of the railway cars, just after loading. The surface contains about the same percentage of lump and fine ores as exist below the surface. Moreover, the surface is large as compared to the tonnage of ore in the car. There is usually ample time for getting the sample, so the sampler is not hurried, and finally, from car samples can be made up composite samples to represent the day's hoist, the shipments from stockpile, and the cargo as shipped.

Composite Samples

Each sample is marked with the number of the car and crushed to go through a 4-mesh sieve and mixed. A small part is then taken from each sample representing a car loaded at the shaft, and this composite sample represents the day's hoist. A small portion is taken from each sample representing a car loaded from stockpile, and this composite sample represents the ore loaded from stockpile on that day.

The remainder of each car sample can be filed away until the dock reports the cars which made up a particular cargo, and the samples representing those cars can then be mixed, the resulting composite sample to represent the cargo.

These car samples may be analyzed separately, or bunched in groups of five or ten for analysis. Using these car samples as units, the scheme best adapted to the needs of each mine may be used, and all other methods of sampling the output may be dispensed with.

To sample the surface of a car of ore, I believe that the rope net system is the best. There are usually 32 knots in the net. The same amount of ore should be taken from under each knot, taking lump or fine ore, whichever occurs under each knot. This method is slow and is not in favor on that account. The following method is more flexible and is quicker, and has given good results wherever used. The principle is the same in both methods.

Method of Sampling Cars

Begin at one end of a car in the center, measure two hammer lengths along center line parallel to sides. At this point take a scoopful, if fine ore, or an equal bulk if lump ore. Measure the same distances and take same quantities in the same way until the other end of car is reached. Then repeat the operation on a line one-half way from center line and side, and then repeat again on line one-half way from center line and other side. For ordinary ores have hammer of such length that this proceeding will take ore from five points in each line, or 15 points per car. For difficult ores, shorten the length of the

hammer so as to touch eight or 10 points in each line, giving 24 or 30 points to each car.

It must not be assumed that the method of sampling the output described, is in any way superior to a mechanical sampling device such as has been installed at the American mine, on the Marquette range. At this mine the ore is carried from the crusher to the cars by belt conveyors. At regular intervals of time, the entire stream of crushed ore is diverted from the car to the sample box automatically. When the loading of the car is completed, the box contains a sample representing the car. It is hard to see how this sample could be improved.

Sampling the Stockpile

The foregoing methods cover the ground for all mines that are shipping to the docks. When a mine is stockpiling its output, the problem is different. In this case, the stockpile may be sampled at regular intervals, two or three times a day. However, the objections to this scheme are numerous. The difficulties of sampling the stockpile are well known, and weather conditions are very bad during the usual stockpile season, that is, in the winter months. In some cases, it will be found better to take a continuous sample of the ore, taking the sample from the top of the cars that carry the ore from the shaft to the stockpile. An equal bulk of ore should be taken from predetermined places on the surface of each car load, taking fine or lump, whichever occurs at these points.

In sampling a stockpile of ore the first point to be decided is, does the surface of the stockpile truly represent the ore in the pile; if it does not, the pile must be trenched, or otherwise opened up. Just how much the pile should be opened up is a troublesome question. Work such as this takes time and money, the amount being determined by the importance of the sample and how soon the information is needed. If the stockpile is to be bought or sold, the exact analysis is of great importance, and justifies the expenditure of considerable money. If the information wanted is only rough approximation of the truth, a quick surface sample will often answer.

In general, if a steam shovel is working on the stockpile, or any part of it, a cross-section of the pile more or less complete, will be exposed, and a sample taken in the cut or face on which the shovel is working will be more reliable than a surface sample of the pile.

In stockpiling ore, there is usually more or less separation of the lump, some of which tends to roll down the outside of the pile, thus forming a ring of lump ore around the base of the pile, if the pile is cone-shaped. The free natural spreading of the ore is seldom found, however, most stockpiles being formed by dumping the ore from cars on a trestle and its natural movement is more or less restricted by bulkheads.

When a stockpile is to be sampled, therefore, the sampling should be planned by the best sampling authorities available. In case of the average mine, this will be the chief chemist, or whoever is held responsible for the sampling. This man, fully informed as to the points mentioned, can then give instructions to the sampler as to the method to be pursued.

Chrome-Vanadium Tire Tests

Service records of chrome-vanadium steel tires as compared with carbon steel tires, compiled by one of the leading trunk lines, show that the former gave approximately twice the mileage obtained from the latter. The locomotives on which the tests were made were of the Pacific type, weighing 229,500 pounds, the weight on the drivers being 150,500 pounds. Tire flange wear, on the division on which the tests were made, was excessive and to determine whether this excessive wear could be overcome by the use of vanadium tires, they were tested on locomotives operating over this division. A locomotive equipped with heat-treated chrome-vanadium tires had a record of 121,000 miles before being shopped and at that time the tires were still in good condition. Carbon steel tires, with which another locomotive was equipped, operating over the same division, made only 60,040 miles before they had to be turned. On account of the flange wear, it was found necessary to reduce the diameter of the carbon tire ¾ inch. Recently, 36 railroads have placed orders for heat-treated chrome-vanadium tires with various steel tire manufacturers.

Standard specifications for heat-treated, chrome-vanadium steel tires recently have been compiled as the result of exhaustive experiments made jointly by the American Vanadium Co., of Pittsburgh, and tire manufacturers.

Table I contains a comparison of the physical properties of heat-treated chrome-vanadium steel tires manufactured respectively at the Latrobe plant of the Railway Steel Spring Co., by the Midvale Steel Co. and the Standard Steel Works. The physical properties of a carbon steel tire also are included in Table I, as well as chemical analyses of the various tires.

Table I.

COMPARATIVE PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF HEAT-TREATED CHROME-VANADIUM AND CARBON STEEL TIRES

Physical Properties of Chrome-Vanadium Tires

Manufacturer	Standard.	Midvale.	Latrobe.	Specified.	Regular carbon tire.
Elastic limit, lbs. per sq. in.	119,500	110,000	118,700	110,000 to 125,000	65,000
Tensile strength, lbs. per sq. in.	146,500	136,000	149,520	140,000 to 160,000	125,000
Elongation in 2 in., per cent.	15.5	17.0	15.0	minimum 12	12
Reduction of area, per cent.	39.0	48.6	34.4	minimum 30	17

Chemical Composition

	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Carbon	0.55	0.57	0.62	0.50 to 0.65	0.68
Manganese	0.64	0.694	0.62	0.60 to 0.80	0.70
Chromium	0.88	0.95	0.95	0.80 to 1.10	0.00
Vanadium	0.17	0.20	0.24	over 0.16	0.00
Silicon	0.30	0.289	0.27	0.20 to 0.35	0.25
Phosphorus	0.034	0.037	0.015	not over 0.05	und. 0.05
Sulphur	0.04	0.023	0.028	not over 0.05	und. 0.05

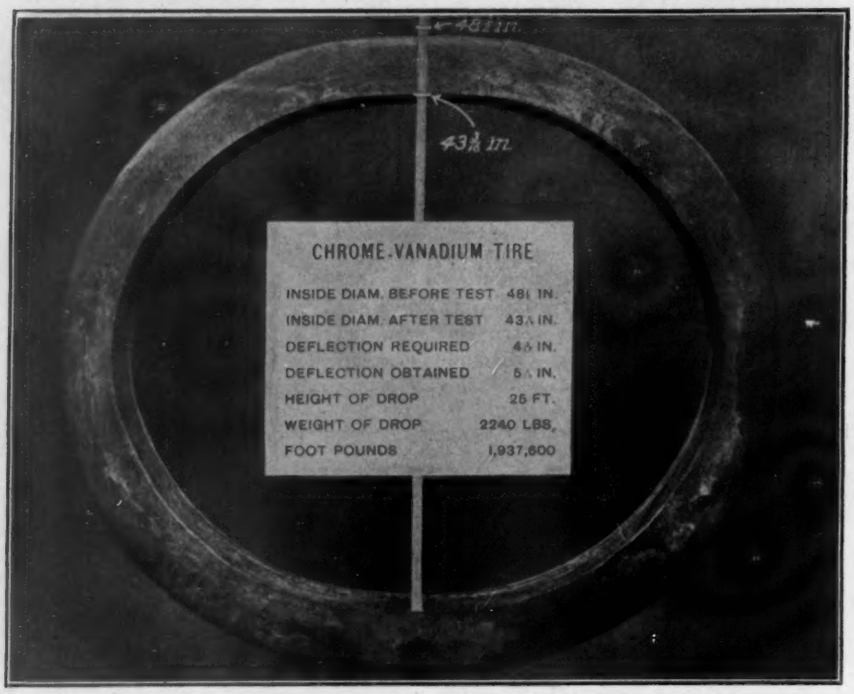
In Table II is given a summary of the results of drop tests of heat-treated chrome-vanadium tires. The accompanying illustration shows a chrome-vanadium tire manufactured by the Standard Steel Works after being subjected to the drop test. The tire originally was 48½ inches inside diameter, 3⅝ inches thick, and the specifications required a deflection of 4 3/16 inches. After a total of 37 blows from different heights up to

25 feet, a total deflection of 5 5/16 inches was obtained. The tire tested by the Midvale Steel Co. had an inside diameter of 55⅝ inches and was 3⅞ inches thick. The weight was dropped from a height of 40 feet, a total of seven blows having been given. The deflection amounted to 5 7/16 inches, although 4⅜ inches only were required by the specifications. The tire tested by the Latrobe works of the Railway Steel Spring Co. had an inside diameter of 56 inches and was 4 inches thick. The specifications required a deflection of 3 11/16 inches, but the total deflection obtained was 5 inches. The weight was dropped 22 times from successive heights up to 30 feet.

Table II.

SUMMARY OF RESULTS OF DROP TESTS OF HEAT-TREATED CHROME-VANADIUM TIRES

Maker	Standard.	Midvale.	Latrobe.
Thickness, inches	3⅝	3⅞	4
Inside diameter before test, inches	48½	55⅝	56
Inside diameter after test, inches	43⅜	50⅛	51
Deflection required without breaking or cracking, inches	4⅜	4⅜	3 11/16
Deflection obtained without breaking or cracking, inches	5 5/16	5⅞	5
Maximum drop, feet	25	40	30
Weight of drop, pounds	2,240	2,240	2,240


CHROME-VANADIUM TIRE
INSIDE DIAM. BEFORE TEST 48(IN.
INSIDE DIAM. AFTER TEST 43⅜ IN.
DEFLECTION REQUIRED 4⅜ IN.
DEFLECTION OBTAINED 5 5/16 IN.
HEIGHT OF DROP 25 FT.
WEIGHT OF DROP 2240 LBS.
FOOT POUNDS 1,937,600

CHROME-VANADIUM STEEL TIRE AFTER DROP TEST, SHOWING A DEFLECTION OF 5 5/16 INCHES

The specifications for heat-treated, chrome-vanadium steel tires, provide that the steel shall be made by the acid open-hearth process and shall have the following chemical composition: Carbon, 0.50 to 0.65 per cent; manganese, 0.60 to 0.80 per cent; chromium, 0.80 to 1.10 per cent; silicon, 0.20 to 0.35 per cent; vanadium, over 0.16 per cent; phosphorus, not over 0.05 per cent, and sulphur, not over 0.05 per cent.

The physical requirements for tires more than 56 inches inside diameter follow: Elastic limit, 95,000 to 115,000 pounds per square inch; ultimate strength, 125,000 to 140,000 pounds per square inch; elongation in 2 inches, minimum 15 per cent and reduction of area, minimum 35 per cent.

For tires not over 56 inches inside diameter: Elastic limit, 110,000 to 125,000 pounds per square inch; ultimate strength, 140,000 to 160,000 pounds per square inch; elongation in 2 inches, minimum 12 per cent, and reduction of area, minimum 30 per cent.

The heat treatment specified consists of reheating the tires after rolling and then quenching in oil. The tires then are to be reheated slowly and uniformly to a temperature sufficiently high to obtain the desired physical properties. The tire must be held at this final temperature at least two hours, which is considered the minimum time required for the changes to be effected throughout the tire section. The tire then should be withdrawn from the furnace and should be allowed to cool in the air. The recommended temperature for quenching is 1,600 degrees Fahr., and the final heating for obtaining the physical properties specified should be, approximately, 1,100 to 1,200 degrees Fahr. The drop tests are to be made by placing the tire vertically in a running position, on a solid foundation, with an anvil weighing at least 10 tons. The tire is subjected to successive blows from a tup weighing 2,240 pounds, falling from heights of 10, 15, 20 feet and upward, until the required deflection is obtained.

New Steel Manufacturing Process

It is well known that during the cooling down of steel from the liquid to the solid condition, there is a range of temperature at which the oxygen of the residuary oxides dissolved in steel, acts on the carbon by forming CO. In the evolution of this gas, other gases are apparently simultaneously evolved. This phenomena is taken advantage of by Paul Girod, of Ugines, France, who has recently received a patent under the title of "Manufacture of Steel". He claims to cool the steel, transferred in a molten state to the electric furnace, down to 1,250 or 1,300 degrees Cent., this being effected by having cold scrap, of the same or a purer composition, in the furnace when the steel is poured in. In using this process, it is supposed that the steel has been dephosphorized in a preparatory furnace, such as a Bessemer converter or an open-hearth in which the oxidation is not carried as far as in common practice. A sufficient amount of oxidizable elements, as 0.1 to 0.15 per cent carbon, 0.1 to 0.2 per cent silicon and 0.2 to 0.3 per cent manganese is left in the metal or is added in cases where circumstances require a more thorough oxidation of the bath. During the process of cooling-down rapidly in the electric furnace, the steel ejects gases up to the moment when the material becomes pasty. It is reheated under a reducing slag until the latter is entirely fluid; the remainder of the gases then escapes and the addition of alloys can be made, to tap and pour the steel. In the first phase of operations, triple silicates of manganese, tin and steel are claimed to be instrumental in forming readily fusible slag.

A New Box Car Loader

Loading bulky material, such as coal, coke, limestone, etc., into box cars, is often necessary when more suitable equipment is not available. Mechanical loaders now are being employed and their field of usefulness is extending rapidly. At the present time most coke plants, coal yards and many manufacturing concerns having large quantities of bulky material to handle, have installed loading apparatus of this character.

Mechanical loaders are divided into two principal types. In one the car to be loaded is tilted forward and back so that each end, in turn, is depressed and filled through the center door of the car. In operating the other type of loader, the car is merely spotted at the desired point on the loading track and some form of conveying apparatus is introduced to carry the material the length of the car.

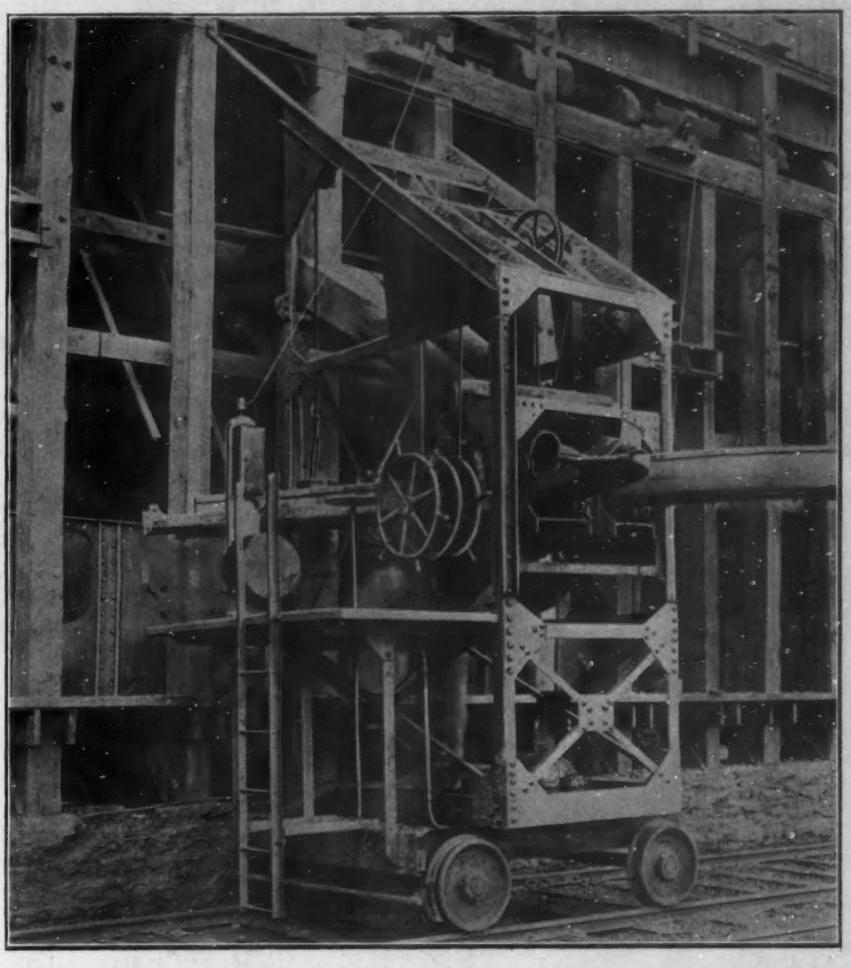
The simplest method of loading coal or similar material into any car is to lead it into place through a gravity chute, and it is on this principle that the new form of box car loader, shown in the accompanying illustration, is designed. This machine is manufactured by Fairbanks, Morse & Co., Chicago, and has been in operation a sufficient length of time to test its practicability.

Disregarding the supporting carriage, the loader consists essentially of a bifurcated discharge pipe or chute which leads the material from the lip screens of the loading pockets to two horizontally curved spouts that are projected into the car at will, and may be adjusted to suit practically any condition of flow and delivery. These horizontal curved chutes are bronze-lined to reduce friction, and the material acquires sufficient velocity while traversing the down-spout to carry it to their ends.

In operation, the height of the curved spouts is first adjusted to suit the door of the car to be loaded and the spouts are extended until their ends are about 25 feet apart, or project well into the ends of the car. Loading is then begun, and as the coal, coke or other material piles up at the ends of the spouts, they are withdrawn, keeping their ends just clear of the pile. By the time the spouts are entirely withdrawn, the car is full.

The loader shown travels on its own track from one discharge chute to another as required, being self-propelled by an electric motor. The movement of the loading chutes is accomplished by hand through three hand wheels. One of these wheels serves to raise and lower the chutes to suit the varied heights of cars; the second controls the movement of the spouts in and out of the car, and by means of the third, the spouts are tilted so as to control the velocity with which material leaves their ends, thus reducing breakage to a minimum. All moving parts are carefully counterbalanced so as to require but little power to adjust them, one man handling the whole readily. In another model of this machine all movements of the spouts are handled by an electric motor.

The capacity of the loader practically is limited only by the capacity of the lip screens which deliver the material to it; a 40-ton car in six to eight minutes is said to be an ordinary loading rate. This box car loading device may be applied to a number of varying conditions, in that it may be operated either entirely by hand or power, and may travel on its own rails or be suspended from the structure of the bins it serves.



MACHINE FOR LOADING COKE, LIMESTONE AND COAL INTO BOX CARS

In 1911, in the Russian empire, there were 25 government and 230 private iron and steel works.

Drop-Bottom Converter

Alexander F. S. Blackwood, of Detroit, has designed a Bessemer converter which he claims can be repaired more readily than the ordinary vessel. The new converter consists of two parts, which can be joined and separated easily, the dividing plane passing through that point of the converter at which the maximum wear of the lining occurs. After loosening the holding shackles, the upper portion of the converter can be lifted by a crane, enabling the bricklayer to repair the lining after only a few hours of cooling, as against the 15 or 18 hours usually required for such work. It is claimed that this arrangement reduces the number of converters necessary for a given output.

According to the United States geological survey, 722,335 men were employed in the coal mines of the United States in 1911. Of these, 172,585 were employed in the anthracite mines of Pennsylvania and 549,750 in the bituminous and lignite mines. The average production for each man was 524 tons in the anthracite mines.

Reversing Electric Motor Drive for Planers

The Application of This Drive to Other Similar Shop Machinery, also is Discussed With Details of Economies Effected

The application of direct-connected reversing motors to planer drive has been practiced for nearly a decade. The use of this form of drive, even in the first stages of its development, indicated that it possessed many advantages over older methods of reversing through clutches or belt shifters. Not only is the usual economy effected in the consumption of power through application of the principle of direct-connected, individual operations, but maximum cutting speeds are sustained uniformly, acceleration is more rapid on the return travel, and an increased production, hitherto unattainable, results. The reversing motor drive has ushered in new records in machining castings.

Naturally, the effective performance of this drive has created a demand that has warranted exhaustive study and tests by manufacturers in developing it for commercial purposes. The General Electric Co., Schenectady, N. Y., recently has placed on the market a reversing, adjustable-speed, direct-connected motor drive that has been carefully tested in service.

Application of Drive to Planers

Probably the most interesting application of this drive to machine tools at the present time is to planers, but the application of the reversing motor equipment in its various forms is almost unlimited. It is now used not only to drive planers, but also screw, worm and rack-driven slotters, turret lathes, wire and tube drawing machinery and other classes of machines reversed through clutches or shifting belts, which methods are often low in efficiency and high in maintenance. A desirable feature of the General Electric reversing motor drive is that it may be attached readily, wherever electric power is available, to machines already installed and in use, as well as to new machinery. The motors for this service are mounted in any place on the machine or floor convenient for mechanical connection. They are of the General Electric commutating pole type with a speed range of 250-1,000 revolutions per minute at 230 volts, up to and including 100 horsepower planer rating. These combinations of speeds allow the motor, in the majority of cases, to be coupled direct to the driving shaft of the machine.

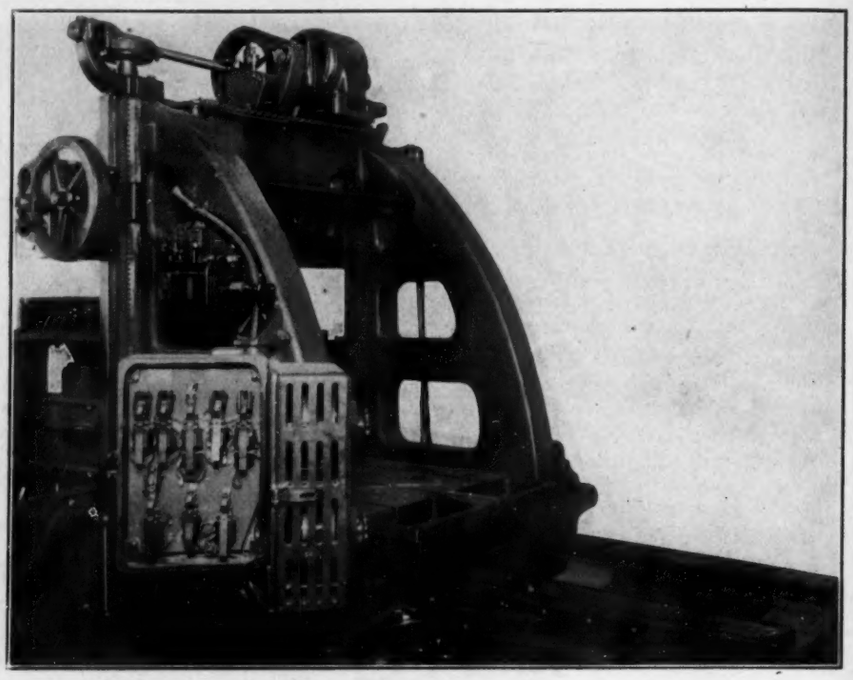


FIG. 2—PLANER, FIG. 1, WITH CONTROLLER PANEL OPEN, SHOWING INTERNAL ARRANGEMENT

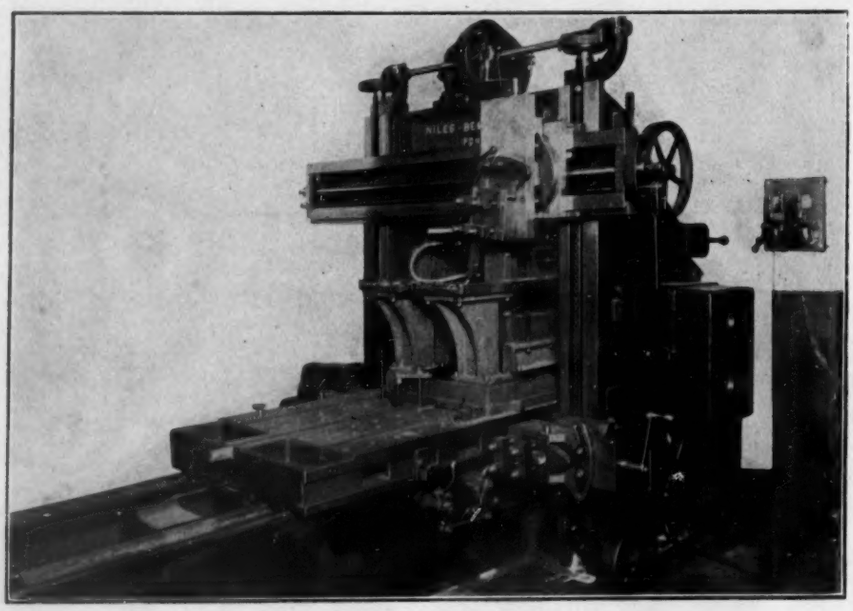


FIG. 1—PLANER, 48 INCHES BY 12 FEET, DRIVEN BY A 20-HORSEPOWER, REVERSING MOTOR WITH CIRCUIT-BREAKER FOR EMERGENCY STOPS

The control consists of a contactor panel and master switch. The contactor panel is mounted usually on the side of the planer housing, or in any convenient place on other machine tools to which the drive may be applied. The panel is made up of eight contactors, similar in appearance to a series contactor, but actuated by shunt, series or differential coils in such a manner as to eliminate entirely electrical disk interlocks. An additional precaution is taken by using

mechanical interlocks to prevent the possibility of short circuits. The panel, field rheostats and all accessories are enclosed in a cast iron box, the cover of which is hinged, so that when swung open the contactors are easily accessible.

The box itself is pivoted about liberal openings in order that the rear of the panel may be swung into view for inspection when required. The leads are carried through these openings from either top or bottom, which prevents them from chafing when the panel is swung out. The field rheostat handles are brought out through the cover of the enclosing case and are plainly marked *Cut* and *Return*. The pointers of these handles traverse a blank ring, which can be marked or graduated in feet per minute, for cutting and return speeds.

The master switch generally is mounted on the side of the planer bed. The switch contains only four contact fingers, two forward and two reverse, one being used in common for both directions, and three segments on the drum. Its sole function is to close the shunt coil circuits of the forward and return line contactors. The motor field is entirely external to the master switch. The panel is encased in a cast iron box, so arranged that the parts and the wiring are accessible. The master switch is operated by dogs on the planer table in much the same way as is now employed for shifting belts. A special, double-pole circuit-breaker is also supplied, which provides for minimum voltage and overload protection. In case the breaker opens or current fails through any cause, it automatically stops the motor, preventing the platen from coasting off the ways.

Dynamic Braking

Owing to the commutating pole design of the motor, starting, stopping and reversing are accomplished with sparkless commutation. To prevent braking dynamically from high speed in one violent step, means have been provided to accomplish this in three distinct steps, braking down slowly from high speeds and then accelerating the brake action at lower speeds. This could not be accomplished with one step of resistance, for at the lower speeds, the breaking action becomes almost *nil*, dragging out the process unnecessarily. Thus, the entire braking is completed in the shortest possible time without undue shock. Reversing is effected without the delay incidental to the use of sluggish relays. A noteworthy feature of the operation of this drive is that the planer table reverses extremely close to a line at the end of the cut.

Cutting and return speeds are entirely independent of each other, so that it is possible to use the slowest cutting speed and the highest return speed, or *vice versa*, in any combination not exceeding 4 to 1, with 35 to 70 cutting speeds and the same number of return speeds, depending on the size of the equipment.

Application of Motor to Old Machines

In the event of attaching the reversing motor to machines already in use, the speed of the driving shaft on the majority of planers will be low enough with the slowest cut to meet the motor speed of 250 revolutions per minute, and only a coupling and the necessary motor foundation will be required. If, however, the planer gearing is of such a ratio that the speed of the driving shaft, when making the slowest cut required, is lower than the motor speed, an intermediate gear and pinion have to be installed for the reduction. In the latter case, an outboard bearing should be provided, which can be taken care of either by a motor shaft extension, or, if the standard motor shaft is used, by a special pinion with shaft extension for the outboard bearing. Where the motor is coupled direct to a planer shaft driving through bevel or worm gearing, provision should be made for taking care of the thrust.

Suitable planer dogs are furnished in each instance. Should there be a boss or web directly behind the position of the operating lever, the bracket supporting the lever can be extended and mounted on a strap, suitably bent for the purpose. The complete equipment comprises the circuit-breaker, motor, contactor, contactor control, with pendent switch if desired, master switch, two dogs, main operating lever, auxiliary operating lever and bearings for the auxiliary shaft. On account of variance in location, bends and length in individual machines, the auxiliary shaft and the connecting rods from this shaft to the operating lever and master switch are not included.

It is interesting to note, comparatively, what has been accomplished with this type of reversing motor drive. Generally, the saving arising from applying power direct to machine tools is considered the amount of friction load which has been eliminated. This often reaches as much as 50 per cent, yet it is in reality only a small part of what may be realized, as proved by numerous tests. A belt-driven planer, or other machine, of approximately 10 horsepower capacity, running at a cutting speed of 25 feet, will drop in speed 2½ to 5 feet, or 10 to 20 per cent while cutting to a value of 10 horsepower, if this approaches the carrying capacity of the belt, due to size, speed or slackness. If the cutting speed is increased to 50 per cent with the same depth of cut and feed, the speed will fall while cutting to nearly what it was originally, the power input increasing only slightly or to the limit of the belt capacity. The maximum slip will be reached when the machine is stalled, the power input remaining approximately constant and the loss being entirely due to friction from belt slippage.

A Slag Pocket Cleaner

Common practice with open-hearth furnaces generally necessitates the closing down of the furnace for cleaning the slag pockets, although some devices are at present in use for obviating this disadvantage. A new slag pocket cleaner has been patented by Horace E. Smythe, of Pittsburgh, who has assigned the patent to the S. R. Smythe Co., Pittsburgh, whereby it is claimed that this inconvenience is avoided. To remove dust, fluxes and metallic substances from the waste gases issuing from the furnace chamber, the gases are led into smaller chambers with an incline sole arranged at the bottom of the downgoing gas flues. From this point they pass into the slag pockets, through which they move downward and enter the checker chamber from below. The checker chamber is divided into two unequal parts, the smaller of which is entered first by the waste gases. After rising, the gases reach the arch of the checker chamber extending continuously over both parts, and pass downward through the main part of the checker work. By this arrangement, the bulk of the impurities, which are carried away from the furnace, accumulate in the auxiliary chamber with the incline bottom. The removal of the air from this chamber is facilitated by a tapping device without interrupting the furnace operations. The slag pocket itself requires cleaning only at longer intervals and dust which may be carried beyond the slag pocket can settle in the flues below the first part of the checker work. This is said to prevent the checker work from becoming clogged, resulting in the uniform heating of the air and gases.

FIG. 1 — GARVIN MACHINE EQUIPPED FOR CUTTING FACE CAMS

Cam Cutting Machine

A 6-inch cam cutting machine, built by the Garvin Machine Co., New York City, is shown in the accompanying illustrations. In Fig. 1, the machine is equipped with a fixture for cutting face cams, the former being mounted on the outer end of arbor *A*, and the blank to be cut is mounted on the opposite end of the same arbor, which is driven by a worm and worm gear from the universal joint, power feed shaft, shown at the front of the machine. The arm containing the work arbor is pivoted at *B* and to offset the stress of the cutter, it is counterweighted at its forward end.

When changing from this face cam fixture, the entire slide is lifted from the top of the knee and the power feed, universal joint shaft can be detached readily for this purpose. The barrel fixture is illustrated in Fig. 2. The work on arbor *C* is rotated by a feeding device at *D*, which is held against the rail by the adjustable spring tension rod *E*. The feed for both attachments is disconnected by clutch *F*, Fig. 1. The weight of the machine is 850 pounds and occupies 36 x 43 inches of floor space.

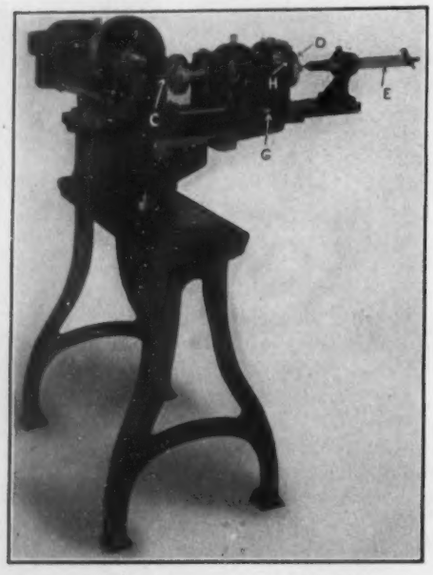


FIG. 2 — CAM CUTTING MACHINE EQUIPPED WITH BARREL FIXTURE

Reviews of New Catalogs

AUTOMATIC STRAINERS.—The Rosedale Foundry & Machine Co., Pittsburgh, has issued an illustrated leaflet, describing its automatic strainer. The object of the device is to remove automatically solid matter such as ice, rocks, sticks, etc., from water supply lines without interrupting the flow of the water. Among the claims made for this strainer are ease of operation and cleaning; elimination of air pockets; one valve and large sediment chamber. This company also makes boiler tube cleaners, rolling mill machinery, and chain grate stokers.

BLOW-OFF VALVES.—The Eynon-Evans Mfg. Co., Philadelphia, has issued an illustrated circular devoted to its blow-off valves that are made for various purposes, and also describing some of its other products, such as blowers, steam condensers, ejectors, heaters, etc. It is claimed that these valves will remain tight under all conditions, this being accomplished by packing which is adjusted while the valve is in service. It is also said that this packing can be removed for inspection while the valve is under full boiler pressure.

ELECTRIC IGNITION AND LIGHTING SYSTEMS. — The Westinghouse Electric & Mfg. Co., East Pittsburgh, has issued a 28-page, illustrated catalog, devoted to its electric ignition and lighting system for automobiles. Wiring diagrams are shown in addition to illustrations of generators, meters, lamps, coils, etc. Other booklets and bulletins received recently, relate to motors as adapted to all types of machinery; watt-hour meters; low pressure turbines, and points of importance in selecting and applying small motors.

SEMI-AUTOMATIC FURNACES.—The W. S. Rockwell Co., 50 Church street, New York City, has issued a 12-page bulletin, describing its semi-automatic furnaces for annealing, hardening, tempering, and for miscellaneous operations on material of irregular shapes and sizes in either aluminum, brass, copper, german or sterling silver, steel, etc. The leaflet contains illustrations of this furnace, which is underfired. Articles that can be annealed in it include cartridge cases, pencil caps, shells, dishes, washers, springs, pens, car axles, shafts, rivets, etc.

MONORAIL SYSTEMS. — Manning, Maxwell & Moore, New York City, have issued a 12-page illustrated bulletin describing monorail systems made by the Shaw Electric Crane Co., a constituent company. A feature of these systems is the switch, which has no moving parts, but which permits the operator to select his route. Another advantage that is claimed is, that there are no open ends of tracks to be guarded, thus avoiding the danger of the trolley brushing off the guard and falling to the ground. The illustrations show the various uses of the system, including boiler-room grab-bucket service, serving railroad tracks, etc. Data on tracks, speeds and horsepower are given, together with information that should accompany inquiries for monorail systems.

JAR-RAMMING MOLDING MACHINES. —A handsomely illustrated catalog, devoted to its extensive line of jar-ramming molding machines, has been issued by the Herman Pneumatic Machine Co., Zelienople, Pa. In addition to the plain type of jarring machines, a combination jar-ramming, squeezer, stripping-plate machine is shown. Numerous views of machines are included in operation in various foundries and a number of intricate castings are shown. The plain jar-ramming machine also is adapted to ramming cores, as well as molds.

RIVETERS.—A 58-page, illustrated catalog, devoted to the Hanna riveters, has recently been issued by the Vulcan Engineering Sales Co., Chicago. Considerable space is devoted to the details of the construction of these riveters, which are said to embody principles somewhat different than those employed in the past. The frames are made of cast steel and is it claimed that but one stroke is necessary for a rivet. This booklet also contains tables of sizes in which these riveters are made, and a list of users. A separate 8-page pamphlet contains testimonials of results obtained by a number of users.

CRANE WHEELS.—The Edgar Allen American Manganese Steel Co., Chicago, has issued an 11-page illustrated catalog, devoted to its manganese steel crane wheels. It is said that these wheels eliminate to a great extent troubles due to abrasion of wheels from the sliding action of the flanges against the rails. Because of the high elastic limit of these wheels, it is also claimed that the design can be reduced in weight considerably. In addition to crane wheels, the company also makes crane motor gears and pinions, with accurately ground and rough ground teeth, as well as other wearing parts of heavy service machinery.

FUEL ECONOMIZERS.—The Green Fuel Economizer Co., Matteawan, N. Y., has published a 24-page booklet, in which is discussed the subject of the best proportions of boiler and economizer surface. Line cuts and halftone illustrations are shown of the Green fuel economizer, also various temperature charts. Another 48-page, illustrated catalog, entitled "What We Make," gives a comprehensive idea of the company's products, which include, in addition to economizers, mechanical draft, heating, ventilating and drying equipments, fans, blowers, exhausters, cone wheels, center crank, side crank and low pressure engines, etc. This catalog also contains a price list.

SWANK'S WORK

Will be Carried on by American Iron and Steel Institute.

James M. Swank retires Jan. 1 from the position which he has so long and ably filled as secretary and general manager of the American Iron and Steel Association. The arrangement by which his important work is to be carried on by the American Iron and Steel Institute is fully explained in the following letter from Mr. Swank, addressed to the members of the American Iron and Steel Association:

Gentlemen:—My friends in the American iron trade have been for some time advised of my intention to ask that I be relieved at the close of the present year of the care and responsibility which attend the collection of the statistics of the iron trade at home and abroad, the preparation and publication of the Directory, the publication of the Bulletin of the association, and, generally the performance of all duties which have for 40 years attached to my position as secretary or general manager of the association. The officials of the American Iron and Steel Institute, whose office is in New York City, having indicated the willingness of the institute to take up and continue the work of the American Iron and Steel Association after the close of the present year, a special committee of the board of directors of the institute called upon my invitation at the office of the American Iron and Steel Association, on Monday, Dec. 9, to personally inquire into the details of the work of the association and to consider the advisability of continuing this work with the present clerical force of the association and with its existing office facilities.

The gentlemen composing the committee who represented the institute were the Hon. E. H. Gary, president of the American Iron and Steel Institute and chairman of the United States Steel Corporation; Charles M. Schwab, president of the Bethlehem Steel Co.; E. A. S. Clarke, president of the Lackawanna Steel Co.; E. C. Felton, president of the Pennsylvania Steel Co.; Powell Stackhouse, president of the Cambria Iron Co., and J. G. Butler Jr., vice president of the Brier Hill Steel Co. Hon. James T. McCleary, secretary of the American Iron and Steel Institute, was also present and participated in the conference.

After examining the details of the work of the American Iron and Steel Association, followed by a full interchange of opinions, the gentlemen present decided to recommend to the full board of directors of the American Iron and Steel Institute that the institute will, on the first day of January next, establish a statistical bureau in the present office of the American Iron and Steel Association, the bureau to be controlled absolutely by the institute and to be devoted to the collection and publication of the statistics of the American iron trade, the publication of a Directory to the Iron and Steel Works of the United States, and the maintenance of such miscellaneous correspondence as may result from the general knowledge that the bureau will be in fact the statistical representative of the American iron trade. All other work, heretofore performed by the American Iron and Steel Association, will be attended to by the institute at its office in New York.

It was further stated that, for the purpose of promoting the work of the bureau of statistics above outlined, the Institute would retain for an indefinite period and for such a time as may be mutually satisfactory to the institute and the employes, such members of the present clerical force of the American Iron and Steel Association as have had charge under my direction of the work of the association above specified, placing William G. Gray in charge of this work and making him solely responsible for its faithful and prompt performance in line with the precedents established by the association, Mr. Gray's management of the bureau to be at all times subject to the approval of the institute. Mr. Gray has been my principal statistical assistant for many years.

I stated to the representatives of the institute who were present at the conference that I would cheerfully transfer all statistical records of the American Iron and Steel Association to the statistical bureau mentioned, and at the time above designated, and that I would also take pleasure in giving to Mr. Gray at any time the benefit of my long experience in the work of the American Iron and Steel Association.

I submit to the members of our association the above details of the conference at our office on Dec. 9, with every confidence that the conclusions reached will meet with their approval. Every one of the gentlemen participating in the conference, with the exception of the secretary of the institute, is a member of our association, so that it may be truthfully said that both the association and the institute were represented.

Very truly yours,
James M. Swank,
General Manager.

HALF MILLION TONS

Will be Capacity of Inland Steel Co. When Additions Are Made.

The First National Bank of Chicago has purchased a second installment of the previously authorized issue of bonds of the Inland Steel Co. This issue amounts to $2,500,000, of which $1,500,000 was sold to the First National last summer. The present sale involved 6 per cent extension and refunding mortgage bonds to the amount of $1,000,000, which will be offered for investment in January. The bonds mature July 1, 1942. With the facilities now under way and in contemplation, the company will have a productive capacity of 500,000 tons of steel yearly. These improvements consist of new open-hearth furnaces, a new plate mill and an installation of gas producers, as previously mentioned in THE IRON TRADE REVIEW. The contract for the latter has been placed, and the two former are now under construction.

The bonds are secured by a first mortgage on all the company's property subject to $2,400,000 in bonds, maturing at the rate of $150,000 each year. The company has $8,000,000 capital stock outstanding quoted in the open market at $220 a share.

Market conditions considered, the company's showing for the year 1911 was unusually good. It amounts to $1,380,063, or approximately six times the fixed charges on the bonded debt, after allowance for depreciation and exhaustion of minerals had been made. The company covenants that it will maintain quick assets of at least 50 per cent of the outstanding bonds of the extension and refunding issue, but not less than $2,500,000.

Toledo Ore Receipts

An error occurred in deciphering a telegram from Toledo, O., regarding the season's ore receipts which in effect credited that port with receiving 1,152,000 tons of ore more than it actually did receive. Toledo received 1,411,278 gross tons of ore during 1912, and not 2,563,278, as published in THE IRON TRADE REVIEW on Dec. 19. The total ore receipts at Lake Erie ports for the season 1912 are, therefore, 37,472,108 tons, and not 38,624,108 tons, as published last week.

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Cleveland, December 26, 1912

The Commission on Industrial Relations

The subjects which are to be investigated by the newly appointed Commission on Industrial Relations are of such far-reaching importance that it was hoped that men of the highest ability in their different lines of activity would be selected for membership. We sincerely hope that the president has chosen wisely, but an examination of the records of some of the members of the commission gives reason for doubting whether the commission is as strong as it could have been. One of our exchanges has called attention to the fact that the men on the new commission are little known, as compared with those who constituted President Roosevelt's anthracite strike commission. This does not appear to us to be a very strong objection to the newly appointed members. In this great country of ours, men may have very high ability without enjoying national reputation. There are, however, other reasons for fearing that the report of the new commission may be disappointing.

At the head of the committee is Senator George Sutherland, of Utah, an able lawyer, who has given much study to workmen's compensation and employers' liability. When a member of a commission on this subject, the Senator assisted in compiling a bill which has passed the Senate and is still pending in the House. Ferdinand Charles Schwedtman, of St. Louis, has also been a student of workmen's compensation. When the subject was being investigated by the Sutherland commission, Mr. Schwedtman traveled in Europe, and in collaboration with James A. Emery, made an excellent report to the National Association of Manufacturers. The subjects in which Messrs. Sutherland and Schwedtman have shown great interest are, of course, important, and they will be valuable members, but the question how best to compensate for injuries is, after all, only one of the factors in the greater problem of relations of employer and employe. George B. Chandler, of Rocky Hill, Conn., is the representative of a publishing house in the New England states and has been a member of the general assembly of Connecticut, where he is called a progressive. Charles S. Barrett, of Georgia, is said to be known in the south as president of the farmers' union. We confess limited knowledge as to that organization. To what extent Mr. Chandler and Mr. Barrett will be able to assist in arriving at wise conclusions is a matter for speculation. President Delano, of the Wabash, is conceded to be a railroad man of ability. Adolph Lewisohn, a New York capitalist, is said to have been one of the special candidates to the American Civic Association. He is known as a philanthropist as well as a capitalist, and is connected with a number of mining and manufacturing concerns. Organized labor will be represented by A. B. Garretson, of Iowa, president of the Order of Railway Conductors; John B. Lennon, treasurer of the American Federation of Labor, and James O'Connell, former president of the Machinists' Union and now vice president of the American Federation of Labor. O'Connell is noted as a radical and is charged with the responsibility for the breaking of the agreement with the National Metal Trades Association members, which resulted in that association refusing to make further agreements with labor unions. The selections from the ranks of labor are not such as to convince one that the decision of the commission will have much weight. The large body of non-union labor is not represented at all, and the tremendous manufacturing and other business interests of the country certainly are not strongly represented.

Here are some of the things into which the commission is expected to inquire:

The general conditions of labor in the principal industries of the United States, including agriculture, and especially those which are carried on in corporate forms.

Existing relations between employers and employes.

The effect of industrial conditions on public welfare and the rights and powers of the community to deal therewith.

The conditions of sanitation and safety of employes and the provisions for protecting the life, limb and health of the employes.

The growth of associations of employers and wage-earners and the effect of such associations upon the relations between employers and employes.

The extent and results of methods of collective bargaining.

Any methods which have been tried in any state or

in foreign countries for maintaining mutually satisfactory relations between employes and employers.

Methods for avoiding or adjusting labor disputes through peaceful and conciliatory mediations and negotiations.

The scope, methods, and resources of existing bureaus of labor, and possible ways of increasing their usefulness.

The question of smuggling or other illegal entry of Asiatics into the United States or its insular possessions, and the methods by which such Asiatics have gained and are gaining such admission.

After looking over the members of the commission and considering the subjects which they are to investigate, one is naturally very dubious about the result. But nevertheless, we believe that members of the commission should have the hearty co-operation of all who are interested in the removal of causes of trouble between employer and employe. Let us hope that the commission will get down to the greatest problem, that of how to prevent strikes, and not devote too much time and energy to other matters which are interesting and, to some extent, important, but not of the vital importance of the abolition of industrial warfare.

Mr. Swank Retires—His Work Goes On

James M. Swank, who for 40 years has held a position of great importance to the iron trade, retires Jan. 1, under conditions which will be satisfactory to him and to the entire iron trade. Mr. Swank has long desired to be relieved of the arduous duties of his position, as secretary and general manager of the American Iron and Steel Association, but until the organization of the American Iron and Steel Institute on a permanent basis was assured, the best method of carrying on Mr. Swank's statistical work was a matter of grave concern. When the Institute broadened its membership so as to make it representative of the entire trade, all interested agreed that the Institute was the one body which ought to carry on Mr. Swank's work. Happily the details have now been adjusted and the Bureau of Statistics of the American Iron and Steel Institute will do the statistical work under the supervision of William G. Gray, who has been associated with Mr. Swank for 26 years. As to Mr. Gray's ability, it is unnecessary to do more than quote the words of Mr. Swank, who says: "Mr. Gray is entirely capable of filling the position which he will hold under the Institute, as its principal statistician."

As we have before had occasion to say, Mr. Swank has not been merely a great statistician; he has been a historian, an able, uncompromising and untiring advocate of the protective tariff, and, above all, a man of the highest character, pure in his private life, courageous in the advocacy of the right, and, in every way, a man who has honored a mighty industry.

The Railroads' Need of Cars

The net shortage of railway cars, as reported by the American Railway Association for Nov. 30, was 36,401, against 51,112 on Nov. 21 (the last report covering nine days instead of the usual 14), 51,169 on Nov. 7, and smaller numbers on preceding dates. Thus the high point in car shortage appears to have been passed about the middle of November, with a net shortage of a trifle over 50,000 cars. The gross shortage was larger, there being always some surpluses reported. In this respect, the distribution of cars shown is good, for the gross surpluses are always only a small fraction of the gross shortages.

Of course, it is unfortunate that there should be any shortages, but the fact that in a crop moving season which, according to some well-informed men, promised to develop the worst car shortage in history the net shortage only slightly exceeded 50,000 cars should be compared with the fact that so recently as last April, when general business was fairly good, there was a net surplus of 139,000 cars, while for several years preceding there were net surpluses even in November and in January and February, 1909, the net surplus was more than 300,000.

The actual experience shows that the railroads are much better fixed for handling the traffic than was expected. The average employment of railroad cars in the past few years has been poor, at least from the railroad man's standpoint, when there are frequently large surpluses and only occasionally slight shortages.

The comparison just made suggests that the heavy car buying by railroads in the past year, which will make the year's total more than 200,000 cars ordered, should be regarded in a somewhat different light than has commonly been accepted. It is very frequently said that railroads are forced to buy cars. So they are, to an extent, but not to the extent of more than 200,000 cars in a year which showed net surpluses during its first eight months running up to 139,000 cars, and is showing net shortages in its four closing months running from 50,000 cars down. Evidently there has not been as much compulsion as thought. Rather, the railroads bought cars at first largely because they were cheap, and more lately they have bought them because they expected business to continue expanding next year, and they have had large earnings by which they could comfortably make the purchases.

The iron and steel industry has been congratulating itself that the railroads have been buying cars in large numbers. It should now congratulate itself that the orders are placed less under compulsion than was thought, and should congratulate the railroads on the favorable conditions in railroad business which makes the purchases easy to compass.

It should be remembered, of course, that a very considerable part of the railroad car orders placed this year has been for purposes of replacement. The total number of cars in the country will not be increased by anything like the number of cars built. In making replacements or continuing to repair old cars, the railroads are governed largely by questions of expediency, especially as to whether the capital is readily available to make the fresh investment. Poor's statistics indicate that from the close of the fiscal years of the various railroads, 1906 to 1911, a period of five years, the number of freight cars increased by 375,000. The number of cars built during the same period may be estimated for purposes of comparison at about 750,000, or almost twice as many. The abandonment of old wooden cars is perhaps at its height at this time. Early in the history of the all-steel and steel underframed cars, the abandonment of wooden cars was much smaller, for the reason that, as wooden cars had been made up to that time, there was a large sprinkling of new wooden cars. Now that the manufacture of wooden cars has been almost abandoned, the average age of all the wooden equipment is greater. On the other hand, as the proportion of wooden to total equipment becomes relatively small, the abandonment of wooden cars will again be small.

MEN OF THE IRON TRADE

Wm. G. Gray, who, on Jan. 1, 1913, will be given charge of the bureau of statistics of the American Iron and Steel Institute, at Philadelphia, was born in that city on March 18, 1858. When he was about 10 years of age, his parents removed to Beverly, N. J., where Mr. Gray received a common school education. When about 15 years of age, he secured a position as messenger boy in the Western Union Telegraph office at Beverly and soon became a fair telegraph operator. After working for the company for about a year, Mr. Gray obtained a position as "devil" in the local printing office at Beverly at a salary of $1.50 per week. Here he learned to set type and operate a hand press, writing "locals" between times for the Beverly *Visitor*, a four-page weekly with "patent outsides." After some 10 or 12 months of country newspaper experience, Mr. Gray decided to seek another job and went to Philadelphia, where he was fortunate in securing a position in the book department of J. B. Chandler & Co., 306-8 Chestnut street. With this firm, Mr. Gray remained for about two years, setting type regularly on the Bulletin of the American Iron and Steel Association and on the Directory of the Iron and Steel Works of the United States. Being anxious to learn job printing, and there being no vacancy in the job department of the Chandler Printing House, Mr. Gray applied for and secured a position with Allen, Lane & Scott. With this firm Mr. Gray finished his trade as a printer, learning job printing and stone work. When about 22 years of age, he was made foreman of the book department of the firm, which position he held for about seven years.

Soon after Mr. Gray entered the employ of Allen, Lane & Scott, the printing of the Bulletin of the American Iron and Steel Association was secured by that firm, and he occasionally set type for the paper. He also worked on the Directory, the publication of which was also secured by Allen, Lane & Scott. When Mr. Gray was promoted to the foremanship of the book department, both publications were placed in his charge. It was while these publications were under his jurisdiction that Mr. Gray first met James M. Swank, the general manager of the American Iron and Steel Association.

In December, 1886, Mr. Gray severed his connection with Allen, Lane & Scott, and in February, 1887, he entered the employ of the American Iron and Steel Association as a proof reader and a general corresponding clerk, as a rule writing letters dictated by Mr. Swank. In the course of a few years, he was made assistant to Wm. M. Benney, who then had charge of the collection of statistics for the association, and who is now the assistant secretary of the National Association of Manufacturers. In 1892, Mr. Benney severed his connection with the American Iron and Steel Association and Mr. Gray was placed in charge of its statistical work. In 1903, Mr. Gray was appointed statistician of the association, which position he has since held. Mr. Gray was also appointed by the federal government an expert special agent for iron and steel for the census of 1900, and had the honor of making the first census report on the tin plate industry of the United States. In this report a complete history of the manufacture of tin plates in this country was given prior to and after 1890. A very full report on the manufacture of pig iron, steel ingots and castings, and rolled iron and steel for the census year 1900 was also made by Mr. Gray.

Frank F. Davis has resigned as treasurer of the Lebanon Valley Iron & Steel Co., Lebanon, Pa.

John Taggart, employed in the Homestead mills of the Carnegie Steel Co., has been appointed assistant master mechanic, to take effect at once.

R. M. Hawkins, who has been connected with the Standard Welding Co., Cleveland, for several years, has resigned his position as assistant purchasing agent.

Harvey C. Garber, Columbus, O., has been elected a director and vice president of the Ralston Steel Car Co. He will have offices in New York City and Columbus.

V. de Ysassi, who has been in charge of the American office at Philadelphia of Sota & Aznar, Spanish ore merchants, will leave in a short time for London to take up his permanent address, as the office is being closed because of the diminished opportunities for importing Mediterranean ores in the eastern market.

T. R. Deacon, founder and manager of the Manitoba Bridge & Iron Works, Winnipeg, Man., and formerly city engineer of Kenora, Ont., has been elected mayor of Winnipeg.

H. A. Schultz, formerly assistant sales manager for the De Laval Steam Turbine Co., Trenton, N. J., is now in charge of the sales department of the Wilson-Snyder Centrifugal Pump Co., Pittsburgh.

Charles A. Bair has purchased the interest of Ralph Arner in the Housel-Arner Machine Co., Williamsport, Pa. Mr. Bair has been connected with the National Foundry Mfg. & Supply Co., Williamsport.

Samuel Siddall, Warren, O., who was recently elected secretary and treasurer of the Warren Iron & Steel Co., Warren, was formerly the active head of the Empire Iron & Steel Co., and the Gary Works, now parts of the Brier Hill Steel Co.

J. A. Horner has been appointed supervisor of the motive power department of the Homestead works of the Carnegie Steel Co., by Superintendent J. C. Lauler. Mr. Horner has been identified with the motive power department of the Pennsylvania railroad.

Frank Hargrove Johnson has resigned his position as supervisor of labor for the Illinois Steel Co., South Chicago, Ill., which he had filled since the office was created, to become sales manager for the West Leechburg Steel Co., Pittsburgh. Friends of Mr. Johnson tendered him a farewell dinner.

Adam Schantz, Dayton, O., and George Sohngen, Hamilton, O., will become directors of the Speedwell Motor Car Co., Dayton, as a result of the acquisition by the stockholders of the Mead Engine Co., Dayton, of a $150,000 interest in the motor car company. Pierce D. Schenck, president of the Mead Engine Co., holds a similar position with the Dayton Malleable Iron Co. W. L. Caten, formerly of the Reynolds Aertite Carbon Co., will take a position with the Speedwell Motor Car Co.

SLIGHT INCREASE

In Iron and Steel Exports—Facts About Rail Movement.

Iron and steel exports in October showed an inconsequential gain over those in September, and were likewise slightly above the average in the nine months ending September. The principal changes from September to October were that there were moderate increases in scrap, pig iron and unfinished steel, and a great drop in rails, from 40,226 tons to 26,127 tons.

Comment has frequently been heard of late relative to our large rail exports. As a matter of fact, the rail tonnage exported has increased very moderately of late, and has practically shown no increase this year as compared with last year, while the proportion of rails to total exports has greatly decreased. The feature really is that rail exports have increased more slowly than other exports. This fact is shown by the following compilation, which gives for the first 10 months in each of the past five years the rail exports, the total iron and steel exports, and the percentage of rail exports in the total:

	Rails, gross tons.	Total, gross tons.	Per cent, of rails.
1908	175,462	815,451	21.5
1909	211,820	989,486	21.4
1910	283,324	1,232,698	22.9
1911	372,860	1,809,315	20.6
1912	379,247	2,478,400	15.3

From an average of 22 per cent in 1908-9-10, rails have dropped to 15 per cent this year, a drop of one-third in the proportion.

October imports were considerably heavier than usual, exceeding by 50 per cent the average in the preceding nine months, and by 20 per cent the average in 1911. The increases were distributed quite uniformly throughout the list. At the most, however, our imports are small. In October, they were one-tenth the exports, and in the 10 months ending October they were one-fourteenth the exports.

Iron ore imports, not included in the general iron and steel tonnage statement, were also heavy in October, the 202,125 tons being the largest for a month since May of last year.

Exports in the calendar year 1912 can be forecasted at 2,980,000 gross tons, for the tonnage items, and at $290,000,000 as the total value of all iron and steel exports, including the non-tonnage items, or manufactures of iron and steel, as well as the regular tonnage items. These estimates are reached by assuming November and December exports to be at the same rate as those in October. This would be an increase of 36 per cent in the tonnage items and of 16 per cent in the total value, over 1911, which made new records in both respects.

IRON AND STEEL EXPORTS, GROSS TONS.

	October, 1911.	October, 1912.	Ten months, ending October, 1911.	Ten months, ending October, 1912.
Scrap	7,511	9,354	69,523	88,675
Pig iron	6,386	29,408	101,711	223,387
Billets, sheet bars, etc	21,783	29,969	202,961	254,415
Wire rods	3,375	4,167	16,235	52,347
Rails	22,918	26,127	372,860	379,247
Steel bars	9,563	19,077	103,279	168,851
Iron bars	1,208	1,958	15,087	18,219
Structural	19,134	24,154	177,591	241,499
Hoop, band and scroll	754	1,960	2,343†	9,956
Sheets and plates	37,470	50,533	289,750	457,655
Tin plates	7,117	5,797	49,674	72,519
Barb wire	11,722	9,355	74,862	80,768
All oth. wire	11,197	12,016	106,657	127,838
Cut nails	697	611	8,983	8,442
Wire nails	4,964	4,062	40,120	60,425
All other, including tacks	1,380	291	10,964	7,498
Pipes and fittings	18,658	18,542	163,475	210,859
Railr'd spikes	*	1,150	*	*4,278
Bolts, nuts, rivets, washers	*	1,399	*	*6,820
Horse shoes	*	61	*	*276
Cast radiators	620	620	3,270	4,426
Totals	186,457	250,611	1,809,315	2,478,400

†Not stated prior to July 1, 1911.
*Not stated prior to July 1, 1912.

IRON AND STEEL IMPORTS, GROSS TONS.

	October, 1911.	October, 1912.	Ten months, ending October, 1911.	Ten months, ending October, 1912.
Scrap	2,105	4,118	16,476	17,232
Pig iron	10,444	13,388	126,318	102,945
Blooms, billets, steel n. e. s.	3,358	1,714	26,603	15,435
Wire rods	969	1,897	13,097	12,632
Rails	468	218	1,149*	3,072
Bar iron	2,340	3,089	23,180	21,227
Structural	529	627	1,156*	2,502
Sh'ts and plates	248	226	1,936	2,857
Tin plates	574	282	13,443	1,784
Totals	21,035	25,559	223,358	179,686

*Not stated prior to July 1, 1911.

IMPORTS BY MONTHS.

	1910.	1911.	1912.
January	56,207	33,071	20,008
February	43,613	20,812	11,622
March	54,176	23,533	13,466
April	47,698	22,392	12,482
May	42,569	23,347	15,955
June	30,332	29,399	21,407
July	41,933	15,782	17,916
August	36,879	19,944	20,572
September	30,961	14,039	18,740
October	31,455	21,035	23,559
November	40,583	13,878	.....
December	31,575	19,683	.....
Totals	487,973	256,903	179,686

IRON ORE IMPORTS BY ORIGIN, 1912.

	October.	10 mths.
Spain	10,410	79,111
Sweden	18,763	299,072
Canada	28,940	90,706
Newfoundland and Labrador	12,150	112,485
Cuba	131,410	1,147,753
Other countries	452	12,450
Totals	202,125	1,741,577

IRON ORE IMPORTS, BY MONTHS.

	1909.	1910.	1911.	1912.
January	105,233	284,823	102,600	154,118
February	61,749	170,427	94,820	129,693
March	108,676	163,633	134,785	157,469
April	74,782	206,135	133,900	178,502
May	97,393	240 833	217,467	194,482
June	124,714	193,415	118,296	180.122
July	172.316	248,810	200,845	185,677
August	209,855	282,949	175,183	178,828
September	164,613	208,892	184.456	180,571
October	178,051	219,571	172,459	202,125
November	174,966	197,833	128.019	.....
December	222,609	173,710	148,902	.....
Totals	1,694,957	2,591,631	1,811,732	1,741,577

Committee Fixes Date

The ways and means committee of the house of representatives has fixed Jan. 10 as the date upon which those who are interested in the machine tool tariff schedule will be allowed to appear before the committee. The date was fixed upon request of representatives of the Cincinnati Milling Machine Co., Cincinnati, O., and the American Tool Works.

Bridge Completed.—The Canadian Pacific railroad bridge across the Saskatchewan river, at Outlook, Sask., one of the largest bridges in western Canada, has been completed. The structure is 3,000 feet long and 156 feet high. The construction work was commenced in 1909.

VALUE OF IRON AND STEEL EXPORTS—TONNAGE AND NON-TONNAGE.

	1908.	1909.	1910.	1911.	1912.
January	$13,468,058	$10,329,388	$14,513,394	$18,738 391	$18,451,914
February	14,063,559	10,947,159	13,949,082	18.690,792	21,801.570
March	15,168,155	13,873,746	17,258,503	22,591.991	24,474,799
April	15.455,319	13.058,297	16,529,260	24,916,912	26,789.853
May	11,281,415	12,964,367	17,658,042	20,616 795	28,050,247
June	11,677,944	13,779,736	16.503,204	20 310,053	24,795.802
July	12,085,951	11,866,772	16,108,102	17,454 772	24,913,052
August	12 058,561	14,134,487	17,628,537	20,013,557	25,450.107
September	11,221,799	12,966,908	16,776,178	19,875 308	23,286,040
October	11,505,063	14,249,598	17,452,085	20,220,833	25,273,059
November	10,895.549	14,434,690	18,594,806	21,547,399	.....
December	12,231,741	15.069,246	18,300,710	22,186,996	.....
Totals	$151,113,114	$157,674 394	$201,271,903	$249,656,411	$238,972,631

EXPORTS OF TONNAGE LINES—GROSS TONS.

	1908.	1909.	1910.	1911.	1912.
January	74,353	70,109	118.681	152,362	151.208
February	81,773	84,837	110,224	150,919	204,972
March	96,681	94.519	124,980	216,360	218,690
April	93,285	100,911	117 921	228,149	267,312
May	64,041	109,808	135,306	178,589	307,656
June	69,770	114,724	120,601	174,247	273,185
July	86,796	100,850	127,578	162.855	272,944
August	86,244	105,690	131,391	177,902	282,835
September	76,732	97,641	119,155	181,150	248,746
October	85,766	110,821	129,828	186,457	250,611
November	71,130	116 105	155,138	187.541	.....
December	77,659	137,806	150,102	190,938	.....
Totals	964,242	1,243,567	1,540,895	2,187,889	2,478,400

BRITISH AND CONTINENTAL MARKETS

BRITISH IRON TRADE

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Dec. 14.

The pig iron market this week has been completely disorganized by the Northeastern railway strike, which concentrated its worst effects upon the Cleveland pig iron district. The stoppage almost immediately compelled 75 per cent of the blast furnaces in the north of England to blow at half blast, while 10 furnaces were damped down. The natural effect was to increase demand and send up prices, but there has since been a little reaction and today's selling figure for Cleveland warrants is 66s 9d ($16.34) as compared with 67s 6d ($16.52), before the strike. Unless the strike closes soon, there must be a general stoppage of iron works in the north of England. The stocks now amount to 247,000 tons. There are strong hopes that the strike, which has been declared on behalf of an engine driver, will be of short duration. Generally speaking, the market is very stringent, and a number of smelters, in all districts, are quoting prices intended to be prohibitive. The hematite market continues very strong, with east coast mixed numbers at 82s 6d ($20.20) over the next four months. Coke supplies continue very difficult to obtain and this scarcity is a very serious feature. The Barrow district has shared in the unfortunate results of the railway strike, a number of the furnaces having been damped down.

The finished iron trade shows a decided upward tendency, largely on account of the increased cost of production, recent wage advances, added to the high price of fuel, have squeezed down profit, and, with regard to raw material, it is pointed out that pig iron, which before the boom cost 47s, cannot now be bought under 72s. It is remarkable that the first advance, following the rise in wages has been declared by the Gas Strip Association, which met on Thursday and advanced prices 5s per ton, making the basis £8 10s to £8 12s 6d. The steel works are finding a greater pressure than ever of orders, and it is believed that December will be the busiest month of the year. Great efforts are being made to push forward production before the Christmas shutdown, which, owing to the occurrence of the festival in the middle of the week, will probably involve a month's stoppage. In the Sheffield district, there are great complaints of billet scarcity and a number of works have been making short outputs for lack of half-finished steel. Most of the billet contracts have now run out, and cannot be renewed except at substantial increases. There has been an increase this week, practically for all descriptions of billets of about 2s 6d per ton. In Sheffield, basic billets have been advanced from £7 2s 6d to £7 7s 6d. An encouraging feature is the marked improvement in the demand for scrap. Everywhere, increased buying and better prices are reported. For old steel rails of good quality as much as 85s is being demanded. In the heavy steel branches, especially dealing with railway material, almost feverish activity prevails. More substantial rail orders have been taken, but there is some concern over the heavy orders that have found their way to foreign, and especially, to American mills.

FRENCH IRON TRADE

Paris, Dec. 5.—Conditions in the French iron market continue to be satisfactory and any bad effects of the war trouble in the near east are successfully withstood. French mills are operating to capacity. Despite recent considerable enlargements and improvement of machinery and methods, it is sometimes found impossible promptly to satisfy the urgent calls. Rail and rolling stock mills, automobile works, etc., are doing particularly well, indeed, some works making a specialty of agricultural machines, motor cars and motors are stated to be fully engaged for six to 12 months to come. Among the recent orders booked is one from the Eastern railway for 800 goods trucks, which was divided among three prominent French firms. The Paris, Lyons & Mediterranean railway has placed a contract for 100 covered goods trucks, 145 wagons for cattle transport and 65 railway carriages, of which, however, part went to Italian construction works.

BELGIAN IRON TRADE

Brussels, Dec. 5.—In the crude iron market in Belgium there is a general improvement in tone to the extent of ½ franc (9.59 cents) per ton in advance of what had been obtainable during the preceding four weeks. Rods are quoted 119.50 francs ($22.70½); rolled rods, 127 francs ($24.13); billets, 134.50 francs ($25.55½); and plates, 137 francs ($26.03) per ton. Iron bars have been selling 1 shilling (24½ cents) higher for export at £6 ($29.21) to £6 1s ($29.45½) per ton; plates and ⅛-inch sheets have advanced to the same extent and are now quoted £6 15s to £6 17s ($32.86-$33.35) and £6 18s to £6 19s ($33.59-$33.83) per ton, f. o. b. Antwerp, respectively. Among export orders received by the Steel Syndicate, a contract for 3,000 tons of girders for North America may be worth mentioning.

Belgian coke has advanced 2 francs (38 cents), which will mean something like 2.50 francs (47½ cents) more at the furnaces. The production of Belgian iron ore during the first 10 months of the year was 1,932,380 tons, against 1,737,400 tons, corresponding period of 1911. There is an improved tone also in the demand for half products. The constant strong demand has induced the iron producers to extend their works. The Baume and Martente foundries have added considerably to their plant and Cockerell's contemplates building eight new blast furnaces. Finished iron goods are likewise in very good tone, and where any changes are noted in quotations they are upward, although for band iron, inland demand, it is impossible to get back the 2s (49 cents) lost some time ago. The expected shrinkage in business in wire and nails owing to the Balkan troubles has taken place and persists, and in these items slight declines in value are registered. Girders and rails are very firm and the Belgian government has issued large orders for the latter, and further good business is in view. Girders continue in good request, but there is not the same demand for rolling stock either at home or abroad.

BRITISH AND CONTINENTAL MARKETS

GERMAN IRON TRADE

Berlin, Dec. 5.—After a prolonged indifference on the German market to the Balkan war, the effects thereof are at last believed to be making themselves felt. There is an obvious hesitation among dealers on the iron market. Nevertheless there is no reduction in price. On the contrary, we have the paradox of a weak feeling on the market and the works being exceptionally firm in the maintenance of their prices; and even still they are unable to accept orders except for delivery at distant dates. It is rather, however, in small goods that the war has made itself felt, and in some departments factory work has certainly been shortened, and workmen have been dismissed. The crude iron market remains firm with a good tone for the future and by far the larger half of the needs of the first six months of 1913 is already provided against, and the quantities available thereafter are held for high prices and are not difficult to dispose of. Half products maintain their previous tone and the demand from the rolling mills is still strong and can hardly be satisfied. In consequence of the uncertain political situation, the Steel Union has abstained from making higher quotations for the first quarter of 1913.

Girders and shapes are seasonably quiet, though export continues satisfactory. Bar iron, on the whole, is well maintained in price, and the mills are engaged into the second quarter of next year, but political considerations have made fresh business quieter. Hoop iron mills are doing well for both home consumption and export. Plates are a little easier, and sheets, too, have been selling below recent prices, although in both cases manufacturers still ask for distant delivery. Pipes continue active and firm. Wire mills have good orders on hand, but report fresh business quieter. Machine and rolling stock works have sufficient orders for some considerable time to come.

RUSSIAN IRON TRADE

St. Petersburg, Dec. 4.—The tone of the Russian iron market at its headquarters, Kharkoff, continue very firm and there is a continued scarcity of pig iron; though perhaps not so acute as had been previously felt. The prices quoted are: For merchant and hoop iron, 1 rouble 44.52 copecks (73.77 cents) per pood (36 pounds); girder, 1 rouble 46.54 copecks (74.78 cents); tank iron, 1 rouble 60.65 copecks (81.83½ cents); roofing iron, 2 roubles 20 copecks ($1.07-$1.12) per pood. All these prices are at the factories. Pig iron costs 68.72 copecks (34.36 cents) per pood.

THIRD EXTENSION

Of Open-Hearth Capacity For Lackawanna Steel Co.

Appropriations have just been made by the Lackawanna Steel Co. for the construction of four additional 60-ton open-hearth furnaces of the stationary type to its No. 2 steel plant at Buffalo. This new construction will increase the capacity of this plant about 150,000 tons of ingots annually. Later more furnaces may be added to this plant.

The extension of crude steel output just arranged for is the third important expenditure for the enlargement of the open-hearth steel capacity of the company, to be recently made. Several months ago, the company put in operation two additional 60-ton furnaces of the stationary type in its No. 1 plant. Very recently, as announced, the company began the construction of two Talbot continuous furnaces, which by use in duplexing will have an annual capacity of about 240,000 tons of open-hearth ingots. The total new steel output of the company to be provided from recent construction on work now under way will aggregate about 500,000 tons of ingots annually. These improvements indicate the greatly increased importance in the near future of the Lackawanna Steel Co. as a maker of open-hearth steel. In the past, the major portion of its steel output has been of the Bessemer quality.

OREGON LAW

Attacked By Railways Which Protest Initiative Bill.

Railways of Oregon have just instituted suit in the federal courts against Oregon's recently enacted initiative bill, in which the people undertook to declare the relationship of freight classes, and the percentage relationship carloads should bear to the rate on less than carload lots. The petition for the injunction filed by the companies and argued before three judges branded the measure as unconstitutional and calculated to upset the whole traffic situation of the state.

Blown In.—Ella furnace, of Pickands, Mather & Co., at West Middlesex, Pa., was lighted last week, after having been out of blast for more than two years.

HIGHER RATE

Announced on Ferro Between Chicago and Gulf Ports.

The Illinois Central railroad and other lines connecting New Orleans and Chicago have announced an increase of 75 cents a ton in the freight rate on ferro-manganese between gulf ports and Chicago, effective Feb. 1, 1913. The present rate is $3.05 and the new rate will be $3.80. The new rate is, therefore, 15 cents a ton higher than the existing rate on the same material between Baltimore or other Atlantic ports and Chicago, the latter being $3.65. Unless the eastern trunk lines make a corresponding advance, the new rate will have the effect of diverting all of the tonnage to the Atlantic ports, whereas, heretofore the majority has gone through New Orleans.

The local market on 80 per cent ferro-manganese is very firm, quotations being made on a basis of $75, Baltimore or New Orleans, for prompt shipment, and $65 for delivery during next year. Many of the larger consumers in this territory are well covered for the ensuing years.

MINING NEWS FROM THE IRON RANGES

Suit to Define Merchantable Ore

A reversal of the usual order, in controversies between fee owners and operators of mineral lands, is noted in the litigation involving the Hawkins mine of the Wisconsin Steel Co., an International Harvester subsidiary. The property is in the Nashwauk district of the Mesabi range and is estimated to contain 15,000,000 tons of ore, part of which, however, is held to be non-merchantable. The litigation concerns the mineral of this latter quality.

Usually it is the contention of the fee owners that all ore shall be mined. In this case, however, it is sought to prevent the operator from taking the poorer material.

The Mississippi Land Co., prominent stockholders of which are the Weyerhaeuser interests and E. C. Whitney, Ottawa, is the plaintiff. The Hawkins mine is operated on a lease for which $500,000 was paid, in addition to royalties which have aggregated $1,000,000 the last few years. The royalty basis is low—20 cents a ton.

Like much other ore on the western Mesabi, there is considerable silica impregnated with the ore at the Hawkins. With this sandy substance washed out, the grade of the mineral is improved. For the purpose of treating the ore in that manner, the Wisconsin Steel Co., as the United States Steel Corporation previously had done, erected a concentrating plant at O'Brien lake, two and one-half miles from the mine. The cost ran into hundreds of thousands of dollars. The plant went into commission a year ago and was operated with success, the past season.

It is the contention of the Mississippi Land Co. that the lease contemplated the mining of only merchantable ore and that that part of the deposit which is not of commercial grade should not be disturbed. It is claimed that this latter grade aggregates nearly 7,000,000 tons.

The Wisconsin Steel Co. denies that the big washery was erected for the purpose of making unmerchantable ore merchantable, but to make low grade merchantable ore more profitable. The best mineral in the mine runs from 56 to 58 per cent in metallic iron. Lower grade ores are marketable, however, even without washing, and it is claimed on behalf of the Wisconsin Steel Co., that 40 per cent material can be shipped at a profit. It is such ore as this that is being sent to the concentrator. Material running down close to 30 per cent, in metallic iron, it is conceded, is not worth taking from the ground. As several million tons of ore are involved, it is expected the suit will reach the higher courts. There is much interest in the Lake Superior country in the outcome.

Oliver Iron Mining Co.'s Shipments

The ore shipments of the Oliver Iron Mining Co., for the season of 1912, excepting possibly a small tonnage of all-rail shipments, make the great total of 23,810,287 tons. The shipments were divided as follows as to ranges:

Range.	Tons.
Menominee	766 056
Gogebic	1,939,396
Marquette	622,552
Vermillion	1,613,138
Mesabi	18,869,145

The mines shipping a million tons or more were as follows:

Range.	Tons.
Norrie-Aurora	1,500,758
Dale (Surface)	1,104,894
Hull-Rust	2,232,180
South Uno (Surfact)	1,305,278
Leonard (Surface)	1,581,197
Genoa (Surface)	1.192,272
Canisteo	2,097,406
Hill	1,186,252

Increases Working Force

Formerly worked only in the day time, the Florence Iron Co.'s Florence mine, Menominee range, is now being operated on double shift. The force of men is being increased to 150. More men also are being added to the payroll at the company's Ernst property, a mile or two distant. This mine is in course of development. The deposit approaches so close to the surface that it is understood a portion of the tract will be stripped and the ore mined by the steam shovel method.

No. 2 shaft of the Ashland mine, at Ironwood, Mich., closed down on Nov. 17 for three months or longer to permit of repairs. The pumps at No. 3 shaft will be operated. The mine is owned by the Cleveland-Cliffs company.

Will Begin Development of Cuyuna Property

The Tod-Stambaugh Co., Cleveland, will soon start the development of the Whitmarsh tract, a Cuyuna range property recently leased from the Crosby interests. Camps are being established, equipment assembled and stripping operations will be under way shortly. One steam shovel will be employed at first. Upwards of 200 men will be on the payroll with the work well advanced. It is intended, in fact, to have the mine on the shipping list next season. The Whitmarsh is in Section 10, T. 46, R. 29, near Crosby, Minn.

It will be the first open-pit mine on the Cuyuna, in which connection it is interesting to note that the Biwabik property of the Tod-Stambaugh interests was the first tract to be stripped on the Mesabi range. Supt. J. S. Lutes, who has been identified with the Biwabik Mining Co. for 17 years, is in charge of operations.

At the time of the opening of the Biwabik mine in the early 90's, the steam shovel, built in sections, was hauled across the country from the nearest railroad station, 10 miles away. The machine weighed 40 tons and its dipper capacity was 1¼ yards.

The majority of the shovels now in use on the Mesabi are of the 70 and 90-ton size. Most of the stripping is done by contract, the price averaging 30 cents or a little less a cubic yard, the approximate cost ranging from 22 to 27 cents in warm weather, and from 27 to 33 cents in the winter season. Stripping has become the rule wherever the horizontal extent of the deposit is sufficient, providing the depth of the overburden is not excessive and there are no projecting ledges of rock.

The chief disadvantage of the open-pit method of mining is the heavy outlay of capital required before returns on the investment are possible. Two or three years' work with steam shovels is necessary to remove the drift and it requires still more time to prepare the mine for economical production. Because of lack of capital, various Mesabi mines, operated by small concerns, are wrought on the underground system, as were others afterwards acquired by larger interests and subsequently stripped. It

MINING NEWS FROM THE IRON RANGES

is figured now to remove 2¼ feet of overburden for every foot of the thickness of the ore deposit. In the neighborhood of 200,000,000 cubic yards of surface material has been stripped on the Mesabi since the first work of the kind was done at the Biwabik in 1893.

Believes New Method of Ore Selling is Needed

That the present method of selling ores is not always satisfactory from the standpoint of the miner, is the belief of Murray M. Duncan, Ishpeming, Mich., general manager of the large mining interests of the Cleveland-Cliffs Iron Co. Mr. Duncan points out that furnacemen often buy 20 months ahead of their immediate requirements, which is a long time considering the fluctuations to which the iron and steel industry is subjected.

The present year, for instance, has proved unsatisfactory to the miners. A year ago the steel trade was dull and makers insisted upon lower ore prices, which they finally obtained. Early in the summer steel prices advanced and later there were new schedules, so that for the last part of the season quotations were higher. In the meantime, the miners were sending out ore on the prices made a year ago and which were low in comparison with the increase in the selling price of steel.

Mr. Duncan does not recommend any particular method of selling ore, but he believes there should be one more equitable to the mining interests. It is, of course, conceded that pig iron quotations might recede after a fair price for ore had been obtained and after season contracts had been made. The difference now apparent should be harmonized, it is argued, on behalf of the miner.

Pearce Mine Closed

The closing down permanently of the old Pearce mine marks the passing of one of the Chisholm districts oldest properties. The Pearce was among the first producers opened in that portion of the Mesabi range and had been operated continuously for more than 10 years. Two years ago, when the mine was considered entirely worked out, Capt. John Schweiger insisted that the property still contained ore. He began underground exploratory work which resulted in the discovery of more than 100,000 tons of Bessemer ore. A new shaft was put down and the ore was taken out. Now a crew of men has dismantled the mine, tearing down the shafthouse and removing all the machinery. Capt. Schweiger will give his entire time henceforth to looking after the interests of the fee owners of the Shenango mine.

Winter Operation on Mesabi Range

The Steel Corporation is planning to strip two properties on the Mesabi range during the coming winter. This is an unusual procedure for that period of the year. The two mines to be stripped are the Adams and the Graham. The Oliver Iron Mining Co. expects to employ between 13,000 and 14,000 men in its underground mines on the Mesabi range during the cold weather.

The Great Northern interests, operating under the name of the Arthur Iron Mining Co., expect to push the work of opening three open-pit properties, the development of which has been started within the last two months. One of these mines is the Whitesides, in the Buhl district. The others are the St. Louis, or Section 27, near Chisholm, and the Smith, which adjoins the Steel Corporation's Dale-Uno mine, in the Hibbing district. It has also been reported that the Longyear-Bennett-Pillsbury lands, which constituted a considerable portion of the Hill lands that were leased to the Steel Corporation, will be opened and worked by the owners. The tracts involved extend from Chisholm west to the Mississippi river and are said to include some of the largest undeveloped ore bodies on the Mesabi range.

A hitherto unknown body of iron ore is said to have been found recently, near the Hanna mine at Iron Mountain, on the Mesabi range, at a depth of four feet from surface.

Shipments Break Record

During the past season, the shipments of ore from the Iron county (Mich.) mines, at the western end of the Menominee range, exceeded 3,000,000 tons for the first time. Of the total 1,800,000 tons came from the Iron River district, the mines of the Crystal Falls field contributing the balance. The largest producers were Oglebay, Norton & Co.'s Bristol mine and Corrigan, McKinney & Co.'s Tobin mine, both at Crystal Falls, the Bristol sending out 367,000 tons and the Tobin 316,000 tons.

The Iron River shippers were the Caspian, Hiawatha, Zimmerman, Riverton group, Chicagon, Chatham, Davidson, Baltic, Fogerty, Youngs, James, Wickwire and Berkshire. To this list there will be added next year from six to eight new mines—Corrigan, McKinney & Co.'s Tully, Munro Mining Co.'s Rogers, Florence Iron Co.'s Hall, Jones & Laughlin Steel Co.'s Forbes, Pickands, Mather & Co.'s Bengal, and probably three properties of the McGreevy Steel Co., the Sheridan, Buchholz and Purcell. It is expected the shipments will be between 2,500,000 and 3,000,000 tons.

Eighteen hundred men have been employed the past season, a number likely to be increased next year to 2,400. Twelve hundred men have been employed in the Crystal Falls mines.

Form Holding Company

The Culbertson-Bunker interests, which control the Almar Mine, a new property on the Vermillion range near Tower, Minn., have formed a holding company, which will pay the original corporation a royalty of 25 cents a ton on all ore taken from the Almar. The new company is also developing some property on the Cuyuna range, in which the original Almar Mining Co. is not interested.

The Gilbert mine of the Oliver company, at Gilbert, Minn., has started a new shaft and will erect a new steel shaft house. Buildings have been moved and stockpiling ground cleared preparatory to the removal of a large amount of ore during the winter.

LATEST MACHINERY NEWS COLLECTED IN LEADING MANUFACTURING CENTERS

In New York, machinery orders have come into the market at a reduced rate during December, compared with other months of the last quarter, but prospects for new business are good. Dealers are working on the largest total of prospective business that has been before them at any time since the beginning of last year. New York dealers with western connections have received inquiries from the Wabash railroad for a large amount of shop equipment. The National Transcontinental Railway of Canada has distributed specifications for extensive requirements for its shops now under construction at Transcona, Man. The list includes the items submitted in two separate lists, which were received by the trade in November and a number of additional machines. The list put out by the Sterling Metal Products Co. was not widely distributed in the New York market. It calls for about 30 machine tools, a part of which will be ordered before the end of December, and the balance during the early part of next year. It is expected that lists will be distributed shortly by the Western Maryland railway and the Ingersoll-Rand Co.

In Pittsburgh, machine tool builders and dealers advise that the present year has been the most prosperous one for three or four years and the concensus of opinion is that 1913 will be equally as good as the year drawing to a close. Demand for all lines has been good, and orders have been well distributed. The Steel Corporation and leading independent companies have figured in the buying. The Pressed Steel Car Co. is reported to be in the market for a spacing table with multiple punch for punching four angles simultaneously.

In Cleveland, the closing of the year finds the machine tool trade quiet but with some degree of confidence expressed by dealers that there will be an early resumption of heavy buying next year. The large volume of business taken from June to November resulted in making 1912 an excellent year for the machine tool dealers in this district and despite the lull of the past two months, the new year is faced with considerable optimism. Some dealers, however, profess little hope of seeing a heavy movement until after the attitude of the incoming administration and congress toward tariff revision is made more apparent. The holiday season interfered with business during the past week, but a number of single-lot orders were closed.

In Cincinnati, a number of the machine tool plants are running at full capacity, in an effort to fill orders that call for delivery this month and early next year. This is business, however, which was closed some time ago, as not many new contracts have been made during December. Some of the machinery plants are not very busy, and little improvement is expected before the end of January, 1913. Business is somewhat scattered, some of the firms having quite a number of orders on their books, while others have little or nothing to do. Radial drills have been in good demand during the past month, with lathes following closely. Woodworking machinery has improved a little, and electrical equipment has been good for several months. Several large railroads have practically stated that they will issue machine tool lists after the first of the year, and this should have a good effect upon the local market.

New Construction

The Stewart Sheaf-Loader Co. will erect a new factory in Guelph, Ont., early in the spring.

The J. P. Devine Co., Buffalo, N. Y., will construct a machine shop at its plant in that city.

The Davis Milk Machinery Co., Waugekan, Ill., is said to be planning the erection of a building of the same size as its present plant.

The Racine Brass & Iron Co., Racine, Wis., is erecting a new office building and making general improvements to its plant.

The Coddington Engineering Co., Detroit, has had plans drawn to erect a one-story brick and steel forge plant.

The Atha Tool Co., Newark, N. J., will make the following additions to its plant on Chapel street: A three-story building, 40 x 170 feet; a two-story polishing and grinding building, 50 x 125 feet; a one-story forge shop, 60 x 65 feet; and a one-story boiler house, 33 x 50 feet. The improvements are estimated to cost $100,000.

Smith & McCaffery have been awarded the general contract for a factory building and warehouse to be erected at Rome, N. Y., for the American Can Co.

The Cincinnati Steel Castings Co., Cincinnati, O., is erecting an addition to its foundry, 80 x 75 feet, and the length of this building, when the extension is completed, will be 220 feet.

Plans are being prepared for a foundry and factory building, to be erected by the Barlow Foundry Co., Newark, N. J. The estimated cost is $100,000.

The Lippincott Co., Cincinnati, O., dealer in food products, will build a new factory building in that city shortly, which will be five stories in height and of steel construction. The dimensions will be 78 x 200 feet, and the total floor area about 100,000 square feet.

The Welsbach Light Co. has made awards for four additions to its plant at Gloucester, N. J. Each of the new buildings will be three stories high, and constructed of brick and reinforced concrete.

It is reported that the Milwaukee Electric Railway & Light Co., Milwaukee, Wis., is preparing plans for a terminal building, sub-station, car barns and executive office building at Racine, Wis., to cost $150,000.

The Elliott-Blair Steel Co., New Castle, Pa., is preparing to build an addition to its plant. The new structure will be of brick, 50 x 150 feet, and 12 feet high. The company manufactures a high grade of steel, such as is used in typewriters and bicycles.

The erection of a plant for manufacturing a mail addressing machine,

recently patented, is planned by a company at Kalamazoo, Mich., headed by S. C. Cox. The inventor of the machine is Percival P. Cox, son of the head of the company.

The American Hardware Corporation, New Britain, Conn., contemplates the erection of a seven-story addition to the P. & F. Corbin plant the coming year, and may also have plans prepared for additions to the Corbin Screw Corporation and the Russell & Erwin plants, to be built some time in the future.

Henry Hope & Sons, Ltd., Birmingham, Eng., will build a metal sash factory at Peterboro, Ont., where a site 2,000 x 220 feet with tax exemptions has been offered. The first building erected will be a machine shop about 100 x 200 feet. The capital for the Canadian company has been subscribed. H. D. Hope, of the English company, will be president, and A. L. Young, Toronto, vice president, secretary-treasurer and manager.

Plans are being prepared by Cowan & Britton, Ltd., Gananoque, Ont., for enlarging their plant to three times the present size for the manufacturing of all descriptions of builders' hardware, specializing tee and strap hinges and butts of all kinds. The building of the new plant will begin early next spring. Presses for stamping butts and hinges and all other classes of hinges and butt machines, will be purchased by the company.

The Lawrence Steel Construction Co., Pittsburgh, has been awarded the contract for erecting the structural steel work for the Wheeling Sheet & Tin Plate Co.'s plant at Yorkville, O. The contract calls for 1,500 tons of structural steel being fabricated by the Fort Pitt Bridge Works, Pittsburgh. The plant, which will be in operation next June, will consist of nine buildings, six of which will be 400 feet long. Twelve mills will be installed. S. Diesher & Sons, Pittsburgh, consulting engineers, are in charge.

Power Plant Equipment

Sealed proposals will be received by Duncan W. Peck, superintendent of public works of the state of New York, Albany, N. Y., until 12 o'clock noon, Dec. 31, on the following improvements to be made on the Cayuga and Seneca canal: Contract C, for constructing a lock, dam, etc., at Seneca Falls, length 1.1 miles; Contract E, for constructing a lock, dam, etc., at Waterloo, length 0.21 mile; Contract Nos. 93 and 94, power plants, electric equipment and machinery for operating and lighting locks and guard gates. Plans may be seen and proposal blanks obtained at the office of the superintendent.

The Dravo-Doyle Co., Pittsburgh, recently has taken the following orders for power plant equipment: Two 18 x 18-inch Ball engines connecting to 150-kilowatt generators, for the Poland Coal Co., Pittsburgh; a two-kilowatt steam-driven generator set for the Meyersdale Coal Co., Meyersdale, Pa., and two 12 x 16-inch Ball engines to drive 75-kilowatt generators for the Pittsburgh & Lake Erie railroad, for installation at Dickenson run.

New Buyers

With a capital stock of $2,500 the Overland Mfg. Co., Chicago, has been incorporated by Henry E. Simon, Albert E. Dennis and A. Barnum to manufacture machinery.

The Waukesha Foundry Co. has been organized at Waukesha, Wis., by C. C. Smith, H. J. Frame and W. Hartshorn. The authorized capital is $10,000.

The Gray Engine Starter Co., Indianapolis, Ind., has been incorporated for $300,000 to manufacture engine starters. The incorporators are R. C. Light, Thomas Gray, H. M. Spaan, William Bosson, and others.

The Shelton-Tatter Machine Mfg. Co., Chicago, has been incorporated with a capital stock of $5,000 to deal in machinery. The incorporators are Guy S. Shelton, Lewis Tatter and Daniel L. Madden.

The Prsco Mfg. Co., 112 Hamilton avenue, Cleveland, advises that it will be devoted to the manufacture of automobile lamps and accessories. The company is interested in such machinery as spinning lathes, polishers, buffers and bake ovens.

The plant of the Pressed Steel Pole Co., Mount Pleasant, Pa., formerly in receivers' hands, has been purchased by the American Cross Arm Co., Pittsburgh. The consideration is said to have been $5,000 in cash and $14,000 in stock. The new owner is planning to begin operations at once.

The Stewart & Cook Mfg. Co., Cincinnati, O., has been incorporated with a capital stock of $150,000, to manufacture grain choppers. The company is now looking for a plant and will begin operations as soon as one is secured. The incorporators are John G. Stewart, J. M. Cook, F. S. Moore, J. F. Scallan and J. F. Costello.

The Hoke Tractor Co., Inc., South Bend, Ind., whose incorporation was recently noted, advises that it is engaging in the manufacture of the "Hoke All-Pull Light Farm Tractor" and attachments. It states that it is the only manufacturer of a one-man tractor that can be attached to binder, mower, disc, harrow or any wheel tool the land owner has on his farm. The new company is an Indiana incorporation. Its officers are: President, John I. Hoke; vice president, Lynn I. Hoke; secretary, Oscar C. Chambers. A new factory will probably be built shortly.

The New Process Raw Hide Co., Syracuse, N. Y., manufacturer of "New Process" pinions, advises that the New Process Gear Corporation, recently incorporated in Albany, N. Y., with a capital stock of $1,000,000, will take over its stock. The reorganization and the increase in capital was deemed necessary because of the expansion of the business of the company. The new name is adopted because it defines better the line of manufacture in which the concern is engaged. The officers of the new company are: President, T. W. Meachem; vice president, T. G. Meachem; treasurer, A. C. Vosburgh, and secretary, J. F. S. Meachem. The directors are unchanged, with the addition of W. H. Diefendorf, chief engineer of the company.

New Incorporations

(In order to assist the post office in delivering letters to new concerns, it is suggested that the names of incorporators be written in the lower left hand part of every envelope addressed to such new companies.)

The following manufacturing companies have been incorporated:

Blake Spark Plug Co., Boston; $100,000; Frank R. Blake, Amasa C. Gould.

Economic Steel Back Co., Boston; $25,000; Russell W. Soule, Charles J. Brown, Elbridge G. Davis.

Reliance Machine Works, Philadelphia; capital, $10,000; incorporators, E. B. Latch, H. A. Wallace and Sarah D. Latch, Philadelphia.

Locke Engine Stop & Valve Co., Salem, Mass.; $90,000; Nathaniel C. Locke, Charles C. Smith, S. Locke Archer.

Waterbury Hair Spring Co., Waterbury, Conn.; $20,000; incorporators, George Hartley, C. H. Hartley and Thomas Mahoney.

H. Jones Pneumatic Tire Spring Co., Bridgeport, Conn.; $100,000; incorporators, Lyman D. Jones, Etta E. Brandeau, Clarence R. Hall.

Norwalk Electrical Mfg. Co., Norwalk, Conn.; $100,000; incorporators, Stewart H. Elliott, Joseph A. Volle Jr. and Wm. B. Hurlbrunt.

Gray Engine Starter Co., Indianapolis; $300,000; to manufacture and sell

Gray engine starters, etc.; R. G. Light, T. J. Gray and William Bosson.

The C. L. Hils Co., Cincinnati, O.; scrap iron, rags and other waste material; $36,000; C. L. Hils, H. R. Hils, J. Schardine, Wm. R. Shannon, Thos. W. Evans.

Ross Power Co., St. Louis; capital, $20,000; John W. Mackey, Edgar D. Weiss, Robert M. Zeppenfeld; to manufacture, buy, sell and deal in engines, machinery, boilers, etc.

Central Welding & Mfg. Co., St. Louis; capital, $30,000; Adolph P. and Mrs. Josephine Erker, Robert Bausch, Hugo Wedemeyer, Eugene B. Dyer, C. H. Beiring.

Union Iron Works, Decatur, Ill.; $60,000; general foundry; incorporators, Porter J. Milliken, H. Clay Dempsey, M. H. Hurd and F. J. Temple.

The McKinnon Motor Vehicles, Ltd., Toronto; capital, $100,000; to manufacture automobiles; provisional directors, Thomas S. Blues, Gordon B. Mansfield and Donald J. McKinnon.

The Stewart & Cook Mfg. Co., Cincinnati, O., agricultural machinery, $150,000; John C. Stewart, James M. Cook, John F. Scallan, Joseph F. Costello and Fred B. Moore.

The Modern Ventilating Co., Cleveland, O.; heating and ventilating devices; $10,000; N. M. Schlitt, J. N. Bostick, Carl L. Hohage, B. B. Given and O. T. Loehr.

The Baxter Hardware Co., Ltd., Windsor, Ont.; capital, $40,000; to manufacture hardware; provisional directors, Charles S. Baxter, David M. Roddy, Elizabeth Baxter and others.

Automatic Can Filling Machinery Co., Newark, N. J.; $50,000; manufacture machinery; incorporators, J. B. R. Smith, James B. Reilly and Wm. J. Woodhead Jr.

The Western Iron Co., Cleveland; manufacture and sale of iron and steel and iron and steel products; $25,000; J. A. Smith, E. A. Williams, J. W. Smith, D. M. Yarger, L. Henegan.

The Ideal Lamp Co, Cincinnati; carriage and other vehicle lamps; $5,000; V. E. Shields, Henry Faultless, William C. Klein, R. S. Oppenheimer, Edward F. Peters.

Royer Case Lock Co., St. Louis; Ellis Royer, John H. DeBuhr, Christina M. Royer; to manufacture watch cases and case locks; capital stock fully paid, $21,000.

Economy Feed Water Purifier Co., St. Louis; G. B. Randall, J. A. Rector; to manufacture, buy, sell and deal in all kinds of feed water purifiers, boilers, tanks, etc.; capital stock, $20,000.

The R. & S. Belting Co., Cleveland; belting, power transmissions, elevating and conveying machinery and appliances; $10,000; D. R. Wilkin, A. J. Mitchell, W. T. Holliday, R. C. Ging, Charles M. Buss.

Brantford Autocycles, Ltd., Brantford, Ont.; capital, $200,000; to manufacture motors and other vehicles; provisional directors, Joseph Ruddy, Wm. D. Shultz, Charles H. Emerson and others.

Moser Mfg. Co., Kane, Pa.; to manufacture fittings for oil and gas wells from iron, steel or bronze; capital, $50,000; incorporators, F. J. Moser, C. E. Moser and W. G. Laird, Kane.

Superior Pump Co., Inc., Manhattan, N. Y.; to manufacture pumps and machinery; $100,000; Edward L. Harper Jr., Henry Burkhardt, Edw. L. Harper Sr., 30 Church street, New York City.

The Newman Silica Sand Co., Massillon, O.; mining and quarrying sandstone, mining clay, etc.; $10,000; 100 shares of $100. Edward R. Davis, Charles D. Reese, A. L. Williams, John Prosser and Wm. Bashbaugh.

The North Carolina Partridge Smelting Co., Knoxville, Tenn.; $300,000; to smelt, reduce, refine and treat ores and metals of all kinds; R. P. Oppenheimer, John H. Kincaid, Mitchell Lang, all of Knoxville, Tenn.

Bargain Machinery & Investment Co., St. Louis; Oliver R. Burkart, Edward C. Teuscher, Bartholomew L. Freihaut, all of St. Louis; to deal in machinery and real estate; capital stock fully paid, $3,000.

Machine Tools

A list of machine tool specifications has been issued by the Wabash railroad.

The Ingersoll-Rand Co., New York, will ask for bids on shop equipment in the near future.

A portion of the 30 machine tools called for in the list of the Sterling Metal Products Co., will be placed this week, while the balance will be ordered early next year.

The Western Maryland railway is preparing machinery specifications for the additions now being constructed at its shops at Hagerstown and Cumberland, Md. The list will probably be distributed within the next few weeks.

The National Transcontinental Railway of Canada, with headquarters at Ottawa, Ont., which distributed two separate lists in November, has put out a pamphlet in which the tools specified in the previous lists are included as well as a number of additional machines. The equipment is for the company's shops under erection at Transcona, Man.

General Industrial

An increase in capital stock from $10,000 to $20,000 has been made by the Summit Foundry Co., Akron, O.

The Pilot Motor Car Co., Richmond, Ind., has increased its capital stock from $50,000 to $100,000.

The Ohio Steel Foundry Co., Lima, O., has increased its capital stock from $400,000 to $600,000.

The Owens Bottle Machine Co., Toledo, O., has increased its capital stock from $3,000,000 to $15,000,500.

The new plant of the Blaw Steel Construction Co., Pittsburgh, at that city, will be in operation in January.

The Atlas Car Co., Chicago, has increased its capital stock from $50,000 to $60,000.

The Alton Steel Co., Alton, Ill., recently organized, has increased its capital stock from $10,000 to $600,000.

The new 65-ton open-hearth furnace of the American Steel & Wire Co., at Donora, Pa., will be in operation early next year.

The Lebanon Valley Iron & Steel Co., which recently bought the Wilmington, Del., rolling mills property, will remove part of the plant to Duncannon and part to Lebanon, Pa.

Reports to the effect that the Jones & Laughlin Steel Co., Pittsburgh, had perfected plans to erect a $10,000,000 steel plant at El Paso, Tex., are officially denied.

The Jamison Coal & Coke Co., Greensburg, Pa., will install 12 mine locomotives and 30 mining machines to be furnished by the Jeffrey Mfg. Co., Columbus, O.

The Babcock & Wilcox Boiler Co., New York City, has been awarded the contract for boilers aggregating 30,000 horsepower to be used in the new plant of the Minnesota Steel Co., at Duluth.

The Westinghouse Electric & Mfg. Co., Pittsburgh, has taken an order for two 500-horsepower alternating current motors for small mill work in the Painter works of the Carnegie Steel Co., South Side, Pittsburgh.

The Mason Engineering & Mfg. Co., New Wilmington, Pa., expects to begin work within a few days, making Mason water heaters and doing general machinery repairing. J. W. Hamilton will have charge of the plant.

The Butler Car Wheel Co. has increased its stock from $300,000 to $750,000; the Butler Bolt & Rivet Co. from $200,000 to $600,000, and the Steel Car Forge Co. from $300,000 to $1,500,000. The companies have offices in Pittsburgh and Butler, Pa.

The Hartman-Greiling Boiler & Machine Co., Green Bay, Wis., has been

awarded the contract for furnishing all machinery, boilers, pump, shafts, pulleys and other equipment for the canning factory now being erected at Brandon, Wis., by M. Zink.

According to advice from Lebanon, Pa., the Lebanon Chain Works Co., that city, has been reorganized with a capital of $150,000. The plant resumed operations early this month after a two years' idleness. Thomas Evans, Lebanon, is president.

The Youngstown Sheet & Tube Co., Youngstown, O., has closed negotiations for a 3,500-kilowatt, high pressure, 25-cycle, 6,600-volt turbine engine and five large switchboards. The contract was placed with the General Electric Co., Schenectady, N. Y.

C. L. Hils & Co., Cincinnati, O., prominent scrap iron merchants of that city, have been incorporated into The C. L. Hils Co., with a capital stock of $36,000. The incorporators are: C. L. Hils, R. H. Hils, J. Schardine, William R. Shannon, and Thomas W. Evans.

The Brier Hill Steel Co., Youngstown, O., has placed a contract with the General Electric Co., Schenectady, N. Y., for two 1,500-kilowatt, 25-cycle, 2,300-volt, alternating current high pressure turbines. The turbines will be installed in the Brier Hill company's new plant.

A portion of the Adrian, Mich., plant of the Page Woven Wire Fence Co., it is reported, will shortly be removed to the company's main works at Monessen, Pa., where the capacity will be materially enlarged. The company has been steadily concentrating the business at Monessen, because of the favorable conditions for operating and shipping at that point.

Improvements and extensions to the West Penn Steel Co.'s plant at Brackenridge, Pa., have increased total capacity to 50,000 tons of steel sheets per annum. This year, the company has added three stands of hot rolls for making steel sheets and three stands of cold rolls; two resquaring shears; two roller levellers; one open leveller, and one pickling machine.

The Elwood City Forge Co., Elwood City, Pa., is installing a 600-pound Chambersburg steam hammer; a 48-inch New Haven double carriage crank shaft lathe and a 7½-ton Johnston & Jennings electric jib crane; a new heating furnace; and a 100-horsepower Union Iron Works boiler. This equipment will practically double the size of the plant.

The Edgar M. Moore Co., Farmers Bank building, Pittsburgh, has taken a contract for a 20-ton three-motor alternating current traveling crane with a 30-foot span and 60-foot runway to be installed in the plant of the Clearfield Machine Works, Clearfield, Pa. The Clearfield company is making other improvements, including the installation of machinery and equipment.

The Bullock works of Allis-Chalmers Co., Milwaukee, at Cincinnati, has received a contract for 1,800 gas engine starting devices for gasoline motors from the Mitchell-Lewis Motor Co., Racine, Wis. This covers only a portion of the Mitchell production for 1913, the remainder being supplied with Berdon starters, manufactured by the Esterline Co., Richmond, Ind.

The Wilson-Snyder Centrifugal Pump Co., Pittsburgh, recently has shipped the following pumps: Three 20,000,000-gallon pumps to the Youngstown Sheet & Tube Co., Youngstown, O., to supply the open-hearth department; a 15,000,000-gallon pump to the Allegheny County Light Co., Pittsburgh, and a 10,000,000-gallon pump to the Mexican Petroleum Co. for installation at Tampico, Mex.

The Grand Trunk railway system has ordered rolling stock as follows: Eighteen locomotives from the Baldwin Locomotive Works; 20 baggage cars from the company's Montreal shops; 63 refrigerator cars from the Canadian Car & Foundry Co., Amherst, N. S.; 155 box cars from the Pressed Steel Car Co., McKees Rocks, Pa., and 16 automobile cars from the Western Steel Car & Foundry Co., Hegewisch, Ill.

The Carnegie Steel Co. has closed a contract with the General Electric Co., Schenectady, N. Y., for one 5,475-kilovolt ampere, high pressure condensing steam turbine, for installation in the Edgar Thomson plant at Braddock, Pa. The Electric company is building a 4,500-kilovolt ampere mixed pressure condensing turbine for the Homestead plant at Munhall, Pa. Both engines are of 25-cycle and have a pressure of 6,600 volts.

The Crucible Steel Co. of America, Pittsburgh, has placed a contract with the McClintic-Marshall Construction Co., that city, to fabricate structural steel for the new plant at Syracuse, N. Y. About 3,000 tons of steel are involved. The McClintic-Marshall company also has taken contracts for structural steel for a new building for the Scoville Mfg. Co., Waterbury, Conn., involving 300 tons and about 400 tons for bridge work for an eastern railroad.

Sale of the Findlay Motor Car Co.'s plant, Findlay, O., has been ordered by Judge Killits in United States district court, as a result of a petition filed against that company by the Ewing American Motor Co. Fred H. Kruse, special master, is directed to sell the property for not less than $50,000, Jan. 18. Of the proceeds $1,500 will be retained by the court pending adjudication of claims of the Lucas Machine & Tool Co., American Motor Co. and other creditors.

The Oshkosh Mfg. Co., Oshkosh, Wis., has just completed the first models of a new type of concrete mixing machine, operated either by steam, gasoline or electricity, which will henceforth form an important line of product of the works. G. F. Halverson has been appointed sales manager of a newly-created department which will have charge of the concrete machinery division. A large assortment of new machinery is now being installed by the company.

The Carbon Steel Co., Pittsburgh, has recently completed the installation of a 500-ton steam hydraulic forge press. A 300 x 70 foot overhead crane runway with crane and magnet for handling raw material is under construction and will be completed by the end of the year. The company is installing a 500-horsepower Rust boiler in the boiler shop and a Newton horizontal milling machine also is being installed. The company contemplates a universal mill with overhead crane runway.

Recent orders placed with the Osgood Bradley Car Co., Worcester, Mass., calling for 100 cars, include 36 60-foot suburban passenger coaches and 25 70-foot steel underframe express cars for the Erie railroad; 15 60-foot steel underframe baggage cars and 14 60-foot steel underframe combination baggage and express cars for the Grand Trunk railroad; five 70-foot steel underframe vestibule passenger coaches of steel-constructed body for the Southern Railway Co., and five frame passenger coaches for the Rutland railroad.

The Pittsburgh office of the Ridgway Dynamo & Engine Co., Ridgway, Pa., recently has taken the following orders: Three 250-kilowatt direct-current engine and generator sets and one 150-kilowatt unit from the Jamison Coal & Coke Co., for installation at Greensburg, Pa.; one 250-kilowatt and one 200-kilowatt engine and generator sets from the Consolidated Coke Co., Uniontown, Pa.; a 100-kilowatt unit from the W. H. Piper Co., Lilly, Pa., and one 125-kilowatt unit from the H. K. Wick Co., Buffalo, N. Y., for installation at Clairton, Pa.

The Quast Mfg. Co., Louisville, Ky.,

manufacturer of women's and children's shoes, has purchased of the James Clark Jr. Electric Co., that city, complete equipment for the operation of its plant by electricity, including 10 3-phase, 60-cycle, 440-volt motors. The James Clark Jr. Electric Co. has also sold to E. H. Taylor Jr. & Sons, distillers, Frankfort, Ky., a Skinner engine and a 30-kilowatt direct-connected generator, and has furnished the Sterling Paint & Color Co., Louisville, one 40-horsepower and one 10-horsepower motor, this equipment being necessitated by a recent fire at the paint company's plant.

According to advice from New Castle, Pa., the Pressed Radiator Co. of America has been re-organized under the name of the Pressed Metal Radiator Co., capitalized at $1,250,000. The plant of the company is located at West Pittsburgh. Among stockholders are: D. N. Seely, W. N. Murray, John K. Frye and Frederick C. Perkins. Mr. Frye has been elected president, and the following have been elected to the directorate: Frederick C. Perkins, John W. Garland, John K. Frye, W. N. Murray, and D. N. Seely, all of whom, with the exception of Mr. Seely, live in Pittsburgh. He resides in Stamford, Conn.

Through a deal closed last week, William Wilkoff, Youngstown, O., takes over the interest of Samuel, D. J. and Isaac Wilkoff in the scrap firm of Wilkoff Bros., that city. The company will continue to operate along the same lines as formerly. Wilkoff Bros., which have operated a large scrap business in Youngstown for years, two years ago purchased the property of the Youngstown Car Mfg. Co., and now operate the National Enamel Co., Youngstown Car Co. and Wilkoff Bros.' scrap yard. William Wilkoff, who has assumed control of these properties, is also a director of the Youngstown Sheet & Tube Co., and is interested in various manufacturing enterprises in Youngstown.

A circular has been issued to the shareholders of the Dominion Bridge Co., Montreal, Que., offering issue of $1,040,000 new stock. The company has about completed the absorption of the National Bridge Co., thus securing a plant capable of turning out about 1,500 tons per month and of extension at small cost as the compay has an option on 560,000 square feet, adjoining its property at Longue Pointe, Que., at a low figure. The Dominion Bridge Co. has outstanding capital of $5,200,000 exclusive of its new issue, while the National Bridge Co. is capitalized at $1,000,000 common stock with a bond issue of $560,000. It is one of the largest Canadian mergers of recent years. James Ross, Montreal, is president of the Dominion Bridge Co.

The board of control of Youngstown, O., has purchased a Kerr turbine pump, costing $9,987, from the Kerr Turbine Co., represented by R. M. Rush, 2137 Oliver building, Pittsburgh, and a reciprocating pump, costing $72,110, from the William Tod Co., Youngstown, O. The Kerr pump will have a duty of 80,000,000 foot-pounds and the Tod pump will have a duty of 163,000,000 foot-pounds. Each pump will have a capacity of 7,500,000 gallons a day. Pumps will be installed in the waterworks pumping station. The Epping-Carpenter Co., Pittsburgh, submitted a bid on the reciprocating pump with a duty of 138,000,000 foot-pounds and Allis-Chalmers Co., Milwaukee, Wis., put in a bid on the same pump with a duty of 160,000,000 foot-pounds daily.

The Van Dorn & Dutton Co., with general offices and factories at Cleveland, announces that it now has added facilities for meeting the rapidly increasing demand for its "hard-service" portable electrically operated drills and reamers. The additional space was provided by disposing of the company's electric department, in which armatures, field and induction motor coils relating to motors for railway and mill service, were produced. The department has been taken over by the Cleveland Coil & Mfg. Co., Cleveland. The company states that the increased demand for its drills and reamers has resulted from the high standard of quality that has been attained and maintained. The additional space has also enabled the company to add materially to the facilities for machine operations as well as the assembly and engineering departments.

The Canadian Car & Foundry Co. has ordered three, single tandem, horizontal, double acting, four cycle engines, to be installed at the Fort William, Ont., plant. The engines will be built by the Mesta Machine Co., Pittsburgh, at its plant at West Homestead. The engines will have cylinders of 28-inch diameter by 36-inch stroke, and will operate at a speed of 150 revolutions per minute. Each engine will be arranged to drive direct connected a 600-kilowatt, 60-cycle, 3-phase, 600-volt alternating current generator. The gas plant will be the largest producer gas engine plant in Canada, when completed. It will consist of four, double bituminous coal generator sets, furnished by R. D. Wood & Co., Philadelphia. The gas plant originally was intended for fuel gas purposes, but as it is necessary to intermittently change from the water gas operation to producer gas it was decided to utilize the waste, or producer gas, for power purposes.

Miscellaneous

The Republic Rubber Co., Youngstown, O., will shortly install a 1,000-kilowatt direct connected mixed pressure turbine. The contract was placed with the General Electric Co., Schenectady, N. Y.

The Stern Foundry & Machine Co., New Orleans, has purchased from the W. W. Carre Co., the railroad connecting Bayou Tallo and Kiln, Miss., 16½ miles in length, and will take the rails, cars, locomotives and other equipment and transfer them to New Orleans, where they will be offered for sale.

Trade Notes

The D. S. Hunter Co., Minneapolis, Minn., is now representing Hubbard & Co., Pittsburgh, manufacturers of shovels, scoops, spades and railroad track tools.

The Standard Chain Co., Pittsburgh, will move its offices from the Bailey-Farrel building about Jan. 1, to the 13th floor of the First National Bank building, that city.

The Burton Saw Co., Vancouver, B. C., will open a branch in St. John, N. B., to sell its products to the mills in New Brunswick and Nova Scotia.

The Century Iron Works, located for many years on West 140th street, New York, have leased for a term of years, the property Nos. 629 and 631 Concord avenue, located near 152nd street.

The Pittsburgh Screw & Bolt Co., early in January, will take possession of the North Side works, now occupied by the Riter-Conley Mfg. Co., which is removing its equipment to its new plant at Leetsdale, Pa.

Fires

A foundry at the Pratt & Letchworth Co.'s plant, Buffalo, N. Y., was damaged by fire last week to the extent of $1,000.

Damage estimated at $300,000 was done by fire last week at the plant of the Wason Mfg. Co., Springfield, Mass., maker of cars for steam or electric railways.

The Ohio Valley Enamel Works, Shadyside, O., near Wheeling, W. Va., was destroyed by fire Dec. 16. According to reports from Wheeling, the fire was caused by a gas explosion.

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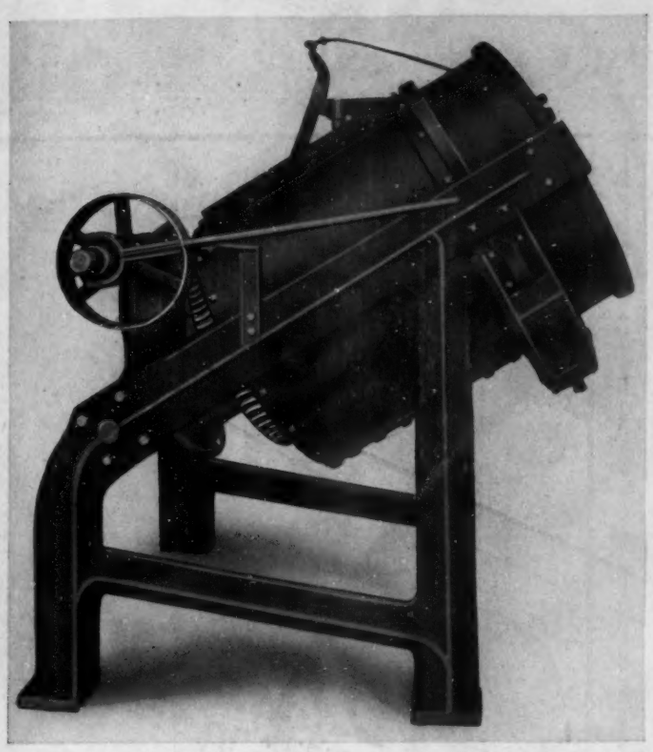

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Mill is of massive and substantial construction throughout, with large wearing surfaces.

Barrel of heavy steel plate, 1" thick, with perforated steel plate lining (easily removable and replaceable) to permit sand and small particles to pass through to conveyor.

Front end of barrel is carried on adjustable rollers with dustproof bearing and dust guard. Roller bearings can be easily removed and replaced without stopping the machine. Rear trunnion is carried in the bearing, and binding and undue wear eliminated.

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Barrel is operated by machine cut worm gear and bronze worm machined, a 3" belt driving the worm shaft. One H. P. is sufficient. No stars or jacks are used in the operation of this mill and a conveniently located lever starts and stops the mill through the clutch puller.

Sand and dust are thoroughly separated, the blasting sand being automatically returned to the nozzle for continued use. No expensive or constant repairs are necessary with a

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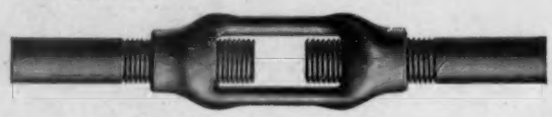

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OF ALL KINDS

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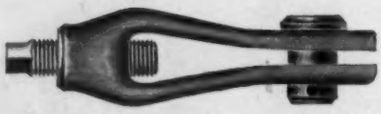
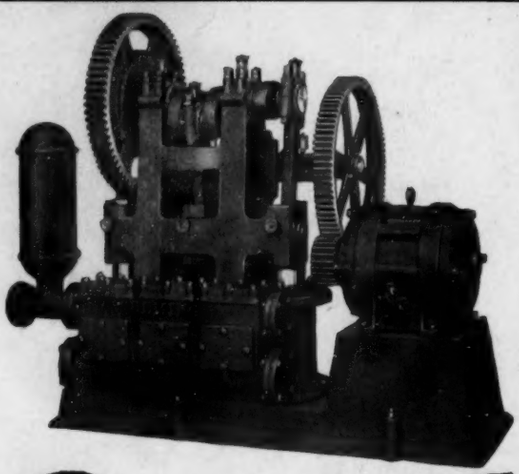


CLEVIS NUTS



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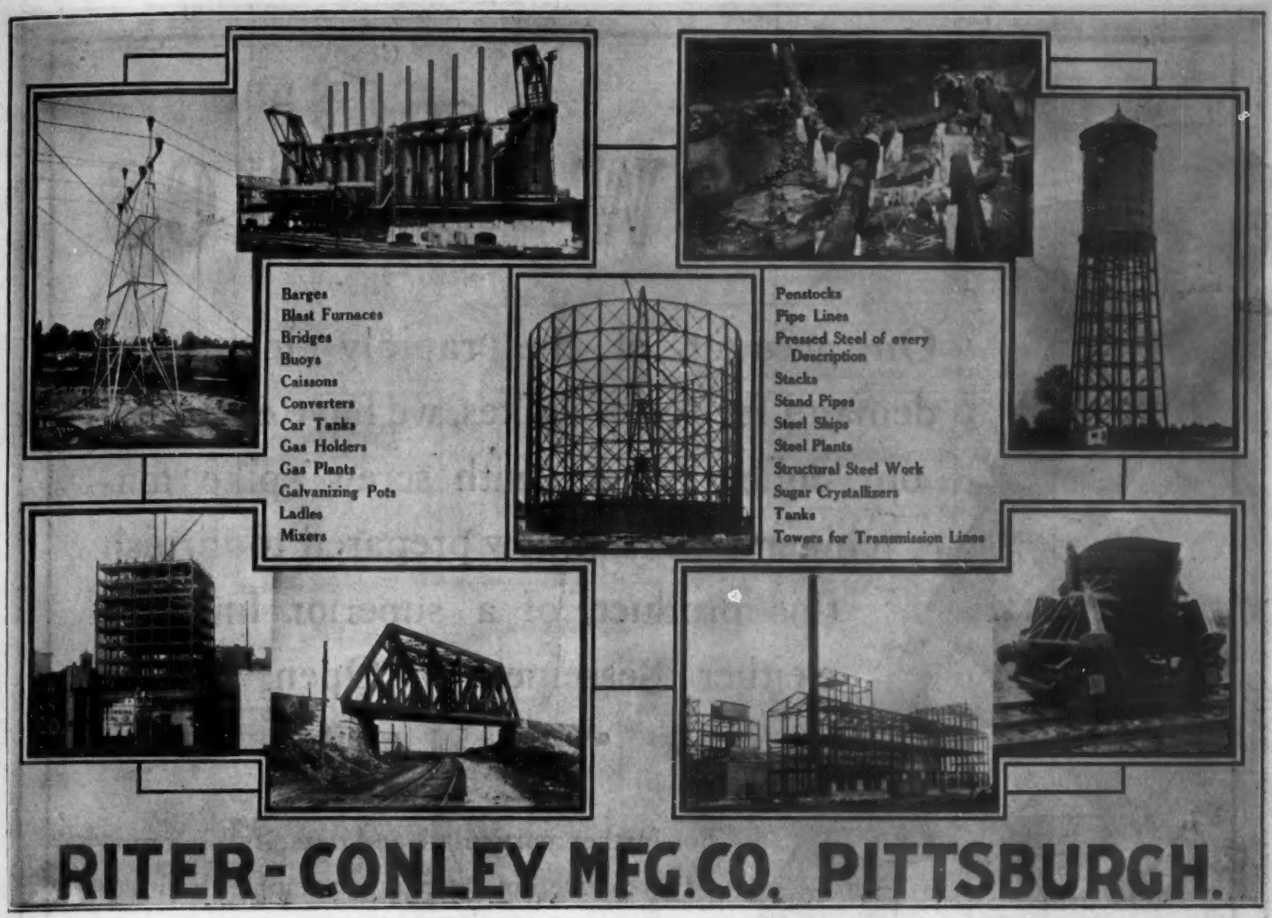

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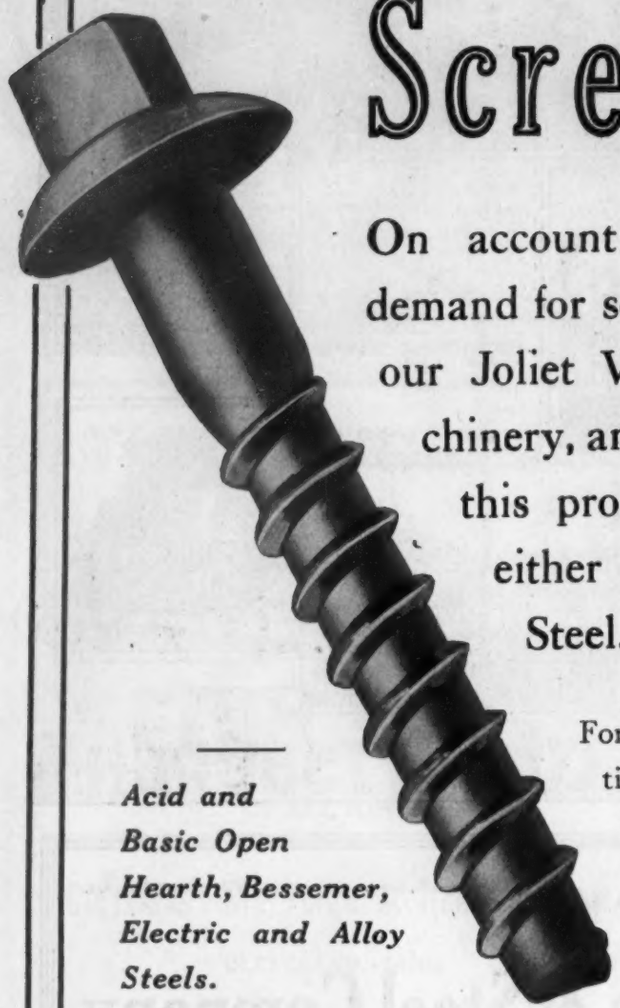

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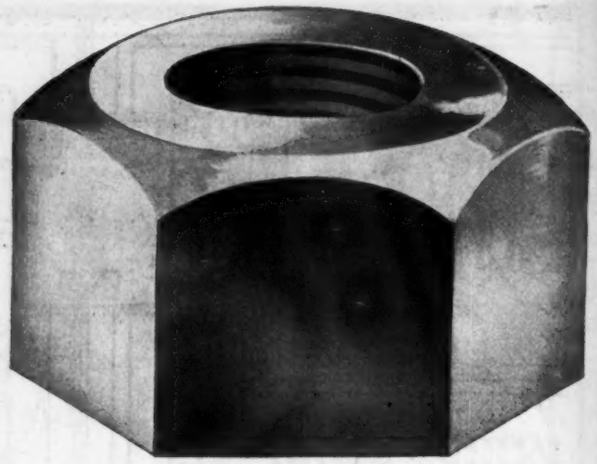

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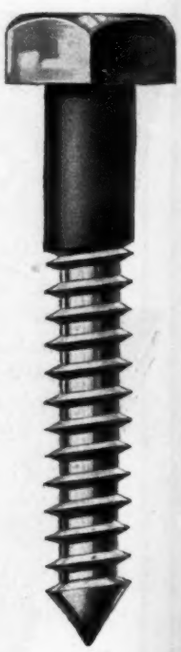

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A Little Lesson on Metal Alloys

By PROFESSOR VISMERA KNIGHT

"GENTLEMEN, I wish to call your attention today to some interesting facts about the remarkable results that follow the mixing of a base metal with alloys.

"I do this as a means of making it clear to you that VISMERA Iron is not really iron, any more than brass is copper—but a new metal that is destined to play an important part in the metal working arts, not only of America, but of the whole world.

"Take Brass for instance—it is a mixture of Copper—a soft metal, with Zinc, a still softer metal; and yet brass has double the tensile strength of copper, and many times the strength of zinc.

"And Bronze, tougher still than brass, is a mixture of copper, with that very soft, weak metal, Tin. And a strange fact right here is that a bronze mixture that is 6 parts copper to 1 tin has 25% greater tensile strength than a mixture that contains 10 parts copper to 1 part tin.

"Pewter is 4 parts tin and 1 part lead, yet it is three times as strong as tin and twelve times as strong as lead.

"You know, too, that the addition of a little of that soft metal Nickel to steel, gives the steel a much higher tensile strength than the steel alone.

"The high-brows explain these queer facts by saying that the molecules in many such mixtures pack themselves closer together than they do in either of the metals alone.

"Now in the case of VISMERA, we not only get a greater density and toughness, but we get a remarkable RESISTANCE TO RUST. That rust-resistance, I think, is largely due to the manner in which the 0.2% COPPER, which we use finds its way to the surface of the sheet, and sort of 'coppper plates' it.

"More important still, VISMERA sheets DEFY CORROSION to a degree not approached in any other metal.

"This is due to the action of the 0.19% MANGANESE on the iron and its impurities. The manganese is the greatest of all 'scavengers' in the iron industry. It unites with the sulphides and oxides, and other impurities and carries them off in the form of gas; and as ***corrosion always begins with impurities,*** and there are ***no*** impurities left in Vismera, there is no place for the corrosive acids to begin their attack; and hence Vismera is practically immune to corrosion.

"The result is a metal that is tough, has a large element of resistance to rust, and is almost proof against corrosion.

"While it looks like an iron sheet, and ***is*** largely iron, Vismera is really a new and superior metal, that a lot of people can use in a lot of places where they are now using copper sheets.

"Black Vismera Sheets have a large element of rust-resistance, but when we galvanize them, we make their lasting qualities many fold greater."

If you are interested in what the soldierly professor has been speaking about, send for samples and literature; and get our quotations on your requirements.

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Facilities for an increased production of bars and other Merchant shapes have recently been provided by completion and opening of our NEW No. 9 MILL. This is designed to roll rounds from ¼ inch to ⅞ inch in diameter, and equivalent sections in squares, flats, ovals and shapes. It has a finishing capacity of approximately 10,000 tons per month.

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YOU'LL BE CONVINCED

if you'll send for a sample and make this test

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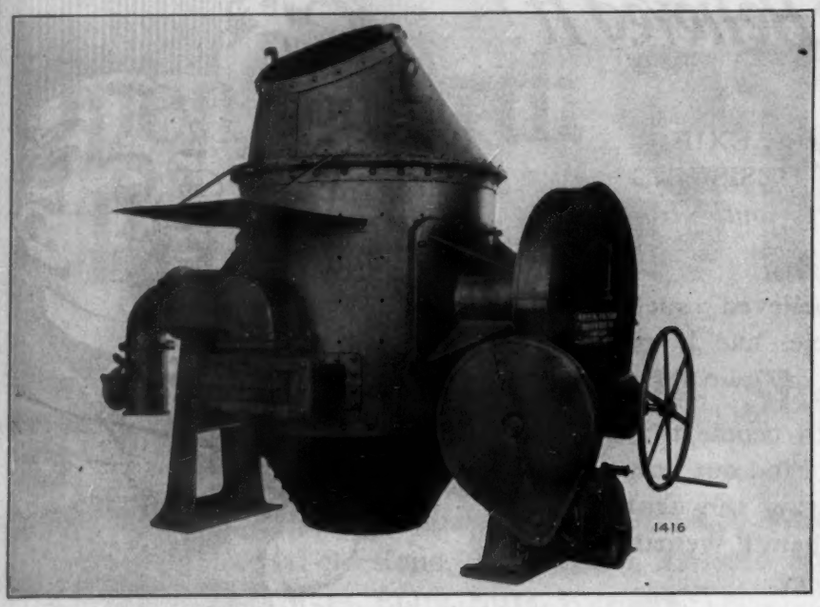

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THIS book is the first complete compilation of all information available regarding the iron ores and mines of the Lake Superior region. Its purpose is to furnish an accurate and reliable reference book on the subject.

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We make this steel under our own secret process, patents for which are now pending. You will find it particularly well adapted for those parts requiring exceptional strength with light weight.

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This is a grade of Open Hearth Steel specially suited for forging. It is .30 to .40 sulphur, and phosphorus under .05.

If you are a user of Forging Steel, you will be highly pleased with results obtained.

We carry a complete line of material on hand ready for immediate shipment — do you get our monthly stock list—if not, write for it at once.

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78% LONGER SERVICE

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These results are shown by the LaBelle Iron Works records.

78% longer service from your steel mill pinions is an advantage worth securing.

Full details in October "Facts"—Write for copy.

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AMERICAN VANADIUM CO.
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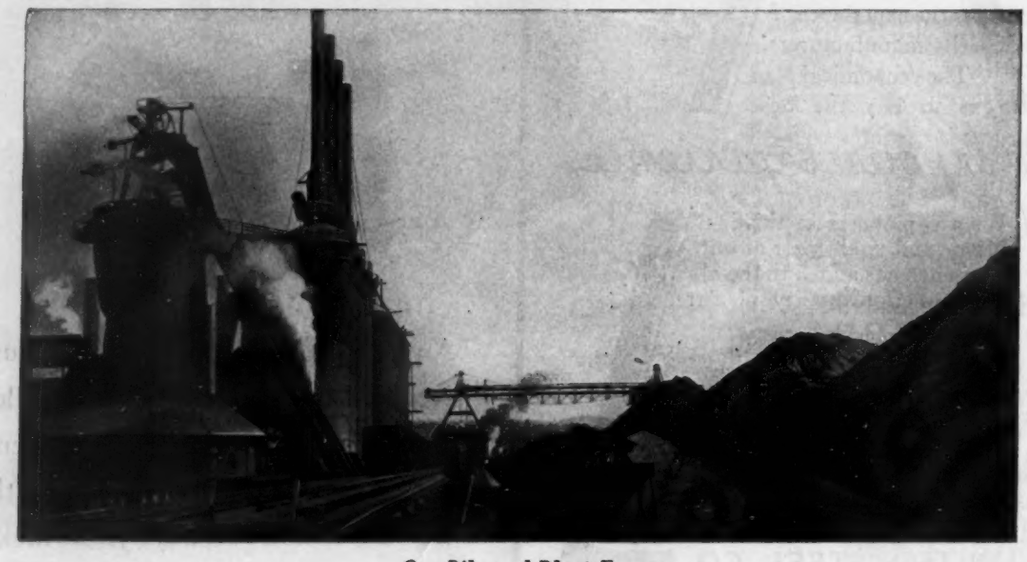
The Manufacture and "National" Mod



Ore Pile and Blast Furnace

*Chapter 6

Need for Cheaper Steel

ABOUT the middle of the last century, an urgent need arose of a better material for general engineering construction; a metal which would be as soft as wrought iron, as strong as steel and cheaper than either was the crying need of the times. Steel before the invention of the Bessemer process was selling for about $300.00 per ton.

Result of Bessemer Process

¶ These conditions led to the discovery that crude iron from the blast furnace could be refined by forcing air through the molten metal without the use of any external fuel. The oxygen of the air combines with the silicon, manganese and carbon in the pig iron, burning out these elements and converting the metal into what resembles the best refined Swedish charcoal iron.

¶ When iron is completely refined by the Bessemer process, it is practically free from carbon and cinder, and combines all the best characteristics of wrought iron with the added strength and uniformity of steel. In this state it is especially adapted to the manufacture of pipe.

The Blast Furnace

¶ The blast furnace is a circular shaft about 90 feet high and about 22 feet inside diameter at the bosh, tapering inward toward the bottom and the top. It is heavily lined with the best fire brick, and strongly braced to withstand the heavy burden which it carries.

Reduction of the Ore

¶ Iron is firmly combined with oxygen and other foreign matter in the ore. To separate the metal from this combination requires intense heat and the presence of other materials, which, under proper environment, have a stronger attraction for the foreign elements in the ore than has the iron.

¶ Coke and limestone in proper proportions for this purpose are charged with the ore into the blast furnace. The coke is burned by a hot blast of air forced in through 12 or 16 nozzles near the bottom of the furnace, at the rate of 40,000 cubic feet per minute under a pressure of about 15 pounds per square inch.

*This is the sixth of a series of announcements as follows:
Chap. I.—Early History—First Iron Tubes. (Published October 3.)
Chap. II.—Early History Continued—(Butt-welding). (Published October 17.)
Chap. III.—Early History Continued—(Early Methods of Piping). (Published November 7.)
Chap. IV.—Early History Continued—(Early and Modern Oil Well Casing Contrasted). (Published November 21.)
Chap. V.—The Ore and the Tube. (Published December 5.)
Chap. VI.—Need for Cheaper Steel. (Published December 19.)

NATIONAL TUBE COMPANY

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Characteristics of ern Welded Pipe

Running Pig Iron Into Ladles

Detail of Process

¶ A very high temperature is thereby produced in the lower portion of the furnace. The gases produced heat the charge in the furnace and take a prominent part in reducing the ore. The waste gases, drawn off from the top of the furnace, have a considerable heating value, which is utilized in heating the blast, generating steam and running gas engines.

¶ The limestone combines with the foreign matter mixed with the oxide of iron in the ore, forming a fluid cinder, which is flushed out every two hours.

¶ The molten metal collects at the bottom of the furnace and is drawn off at intervals of four hours, either being molded into "pigs" or run into ladle cars for immediate treatment in another department of the works.

¶ The next chapter will briefly cover the refining of the crude metal in the Bessemer Converter, and will appear January 2.

We have recently issued a booklet, "MODERN WELDED PIPE," which treats of the manufacture, uses and characteristics of tubular products. While this book was not issued for general distribution, we will gladly send a copy to any person whose letter-head or activities would indicate a legitimate use for same.

To readily identify "NATIONAL" material, and as protection to manufacturer and consumer alike, the practice of the National Tube Company is to roll in raised letters of good size on each few feet of every length of welded pipe the name "NATIONAL" (except on the smaller butt-welded sizes, on which this is not mechanically feasible). When writing specifications or ordering tubular goods, specify "NATIONAL" Pipe.

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CAMBRIA

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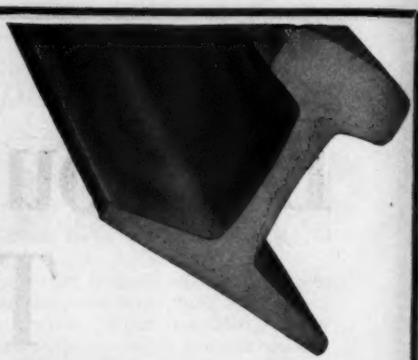

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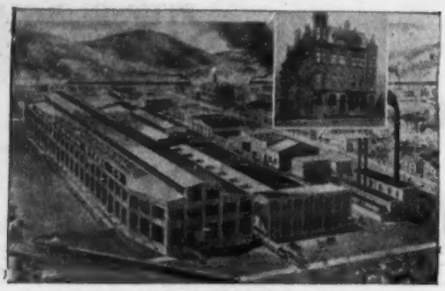

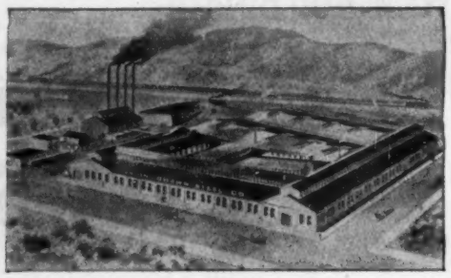

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COLD TWISTED SQUARE STEEL BARS

For Concrete Reinforcement

60,000 LBS. ELASTIC LIMIT

¶ 60 to 100 per cent. increase in Elastic Limit.
¶ 20 per cent. less steel required—a saving in cost.
¶ 21 to 39 per cent. increase in tensile strength.
¶ COLD TWISTING removes the scale of oxides, thereby permitting closer bond with the concrete.
¶ Greater variety of sizes than any other concrete bar. You can specify the exact size required.
¶ Same weight as plain squares of like size.
¶ The TWISTING COLD insures uniformity of the twists and is a physical test on each and every bar—which is not true of any other type of deformed bar.
¶ Safety from brittleness. Our COLD TWISTED SQUARE bars are warranted to bend around a diameter *three* times the size of the section.

We manufacture all sizes from 1-4" to 1 1-2", increasing by 16ths and in lengths up to 40 feet.

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16

THE TURNER-VAUGHN AND TAYLOR CO.
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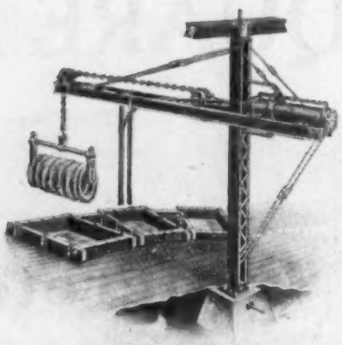
WIRE MILL EQUIPMENT



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"Red Cut Superior"

HIGH SPEED STEEL

will better the quality of your product without an additional expense. Tools made from it always keep sharp and in perfect condition.

We also make

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Carbon Tool Steel and Special Alloy Steels.

Vanadium Alloys Steel Co., Latrobe, Pa.

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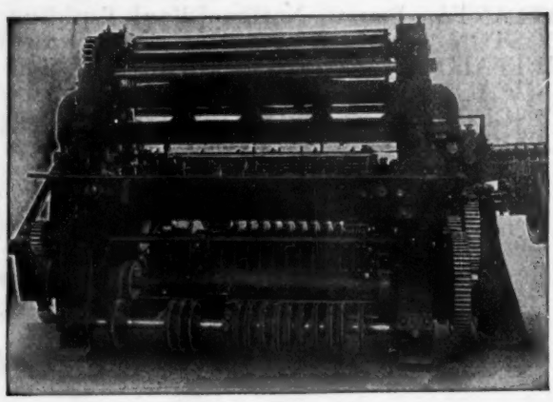
Why drift along producing a few hundred rods per day—when you should be producing up in the thousands on one machine. Let us design or re-design and build your machine along modern high speed lines.

We are Specialists.

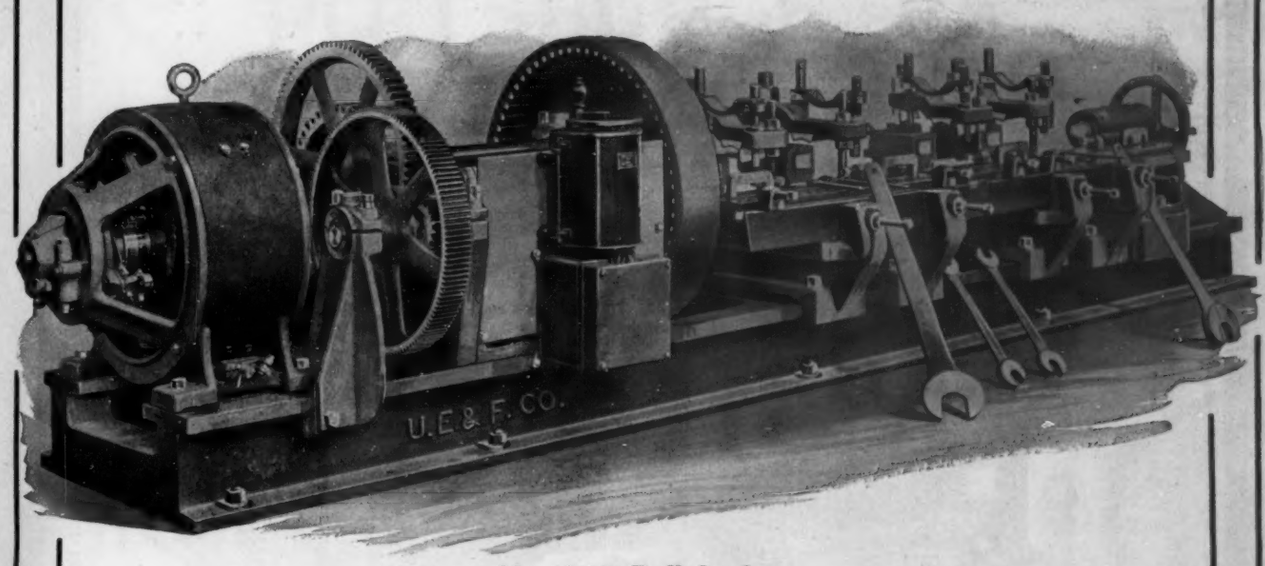
The Johnston & Jennings Co.

CLEVELAND, Sixth City

Also Designers and Builders of Hoists, Cranes, Hammers, Rolling Mill and Special Machinery



Labor Saving and Output Increasing Methods



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Steel Castings up to 50 Tons

Cast Steel Machine Molded Gears up to 18 ft. Diameter

High Speed Steam Hydraulic Forging Presses

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"Makers of the Largest Rolls"

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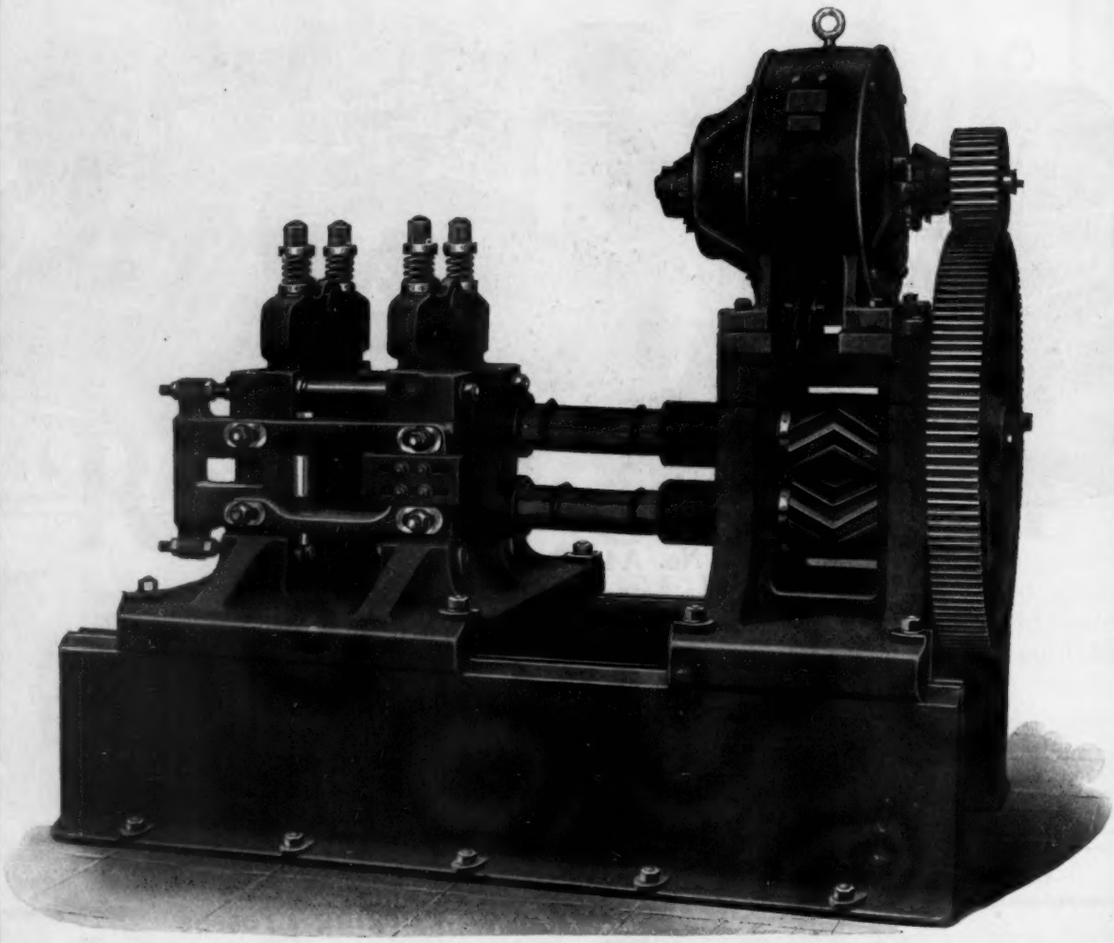
Shears, Punches, Saws, Coping Machines



Rail Cambering Machine--Motor Driven

MACKINTOSH, HEMPHILL & CO.
FORT PITT FOUNDRY
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MESTA
MACHINE COMPANY
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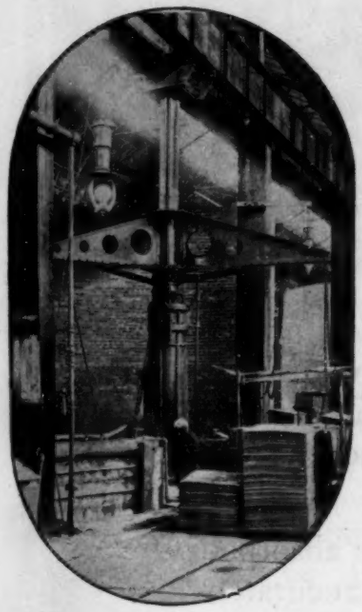
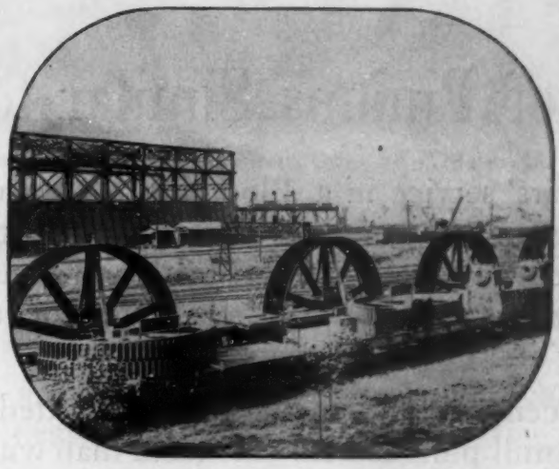
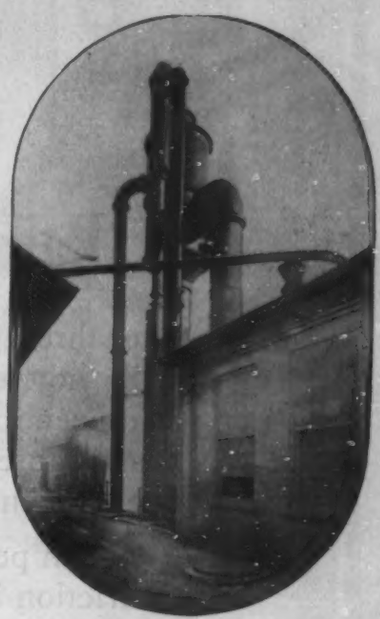


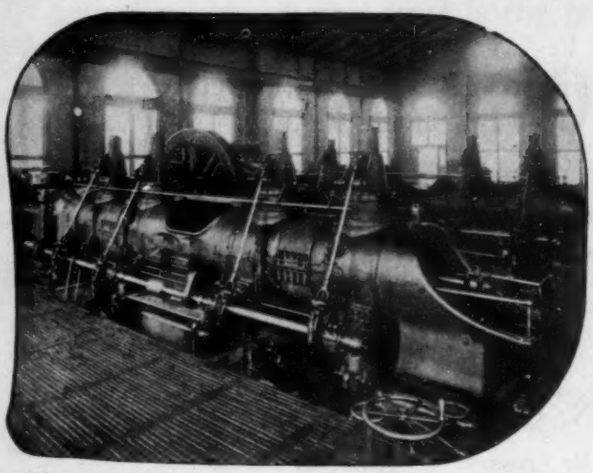
MESTA PICKLING MACHINE



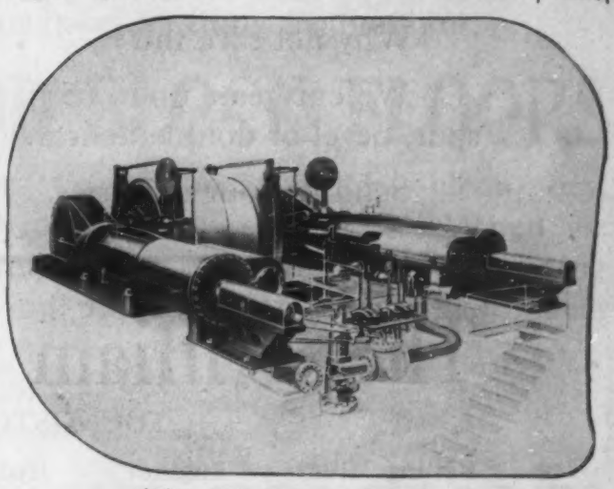
SHIPMENT OF MESTA GEARS & ROPE DRIVE



CONDENSER INSTALLATION

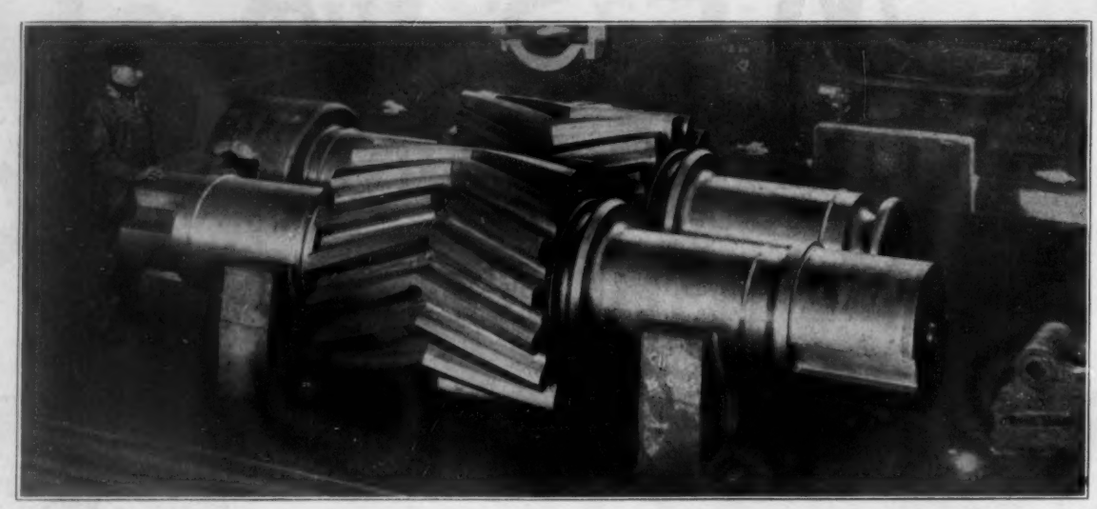


MESTA GAS ENGINES — WICKWIRE BROS PLANT



MESTA HOISTING ENGINE FOR MINE USE

SEND FOR LATEST BOOKLET



A Pair of Pinions Similar to These

after three years' service in a Blooming Mill showed practically no wear in the teeth and over 1,000,000 tons of steel had been rolled. Proper design of teeth and accurate cutting insure absence of vibration and silent running and increase the efficiency and life of the machine.

Ten per cent more of the power transmitted is absorbed in friction in mill pinions with cast teeth than with accurately cut teeth.

Why not save this?

We cut gears up to 65" face and 35 feet pitch diameter, spur, bevel or double helical.

Send us your inquiries.

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Rolling Mills **Engines** **Hydraulic Presses** **Special Machinery**

Section of Creosoted Block Floor—Deere & Co., Moline, Ill.

There is a Steady Improvement in Shop Floors

More shop owners are learning to measure floor value by the service it gives---not by the first cost.

When a shop floor runs down, expenses run up---time is wasted in trucking, etc.,---and time is the most expensive thing in the plant.

CREOSOTED WOOD BLOCK FLOORS

do not rut or crack. They are practically indestructible---clean, dry, sanitary, easy on the feet and have low traction resistance. When we say Ayer & Lord Creosoted Blocks make the best shop floors---standing up under the severest tests and giving universal satisfaction, we expect you to make no allowances whatever.

Send for free booklet "FLOORS" and the names of concerns where installations have been made.

AYER & LORD TIE COMPANY
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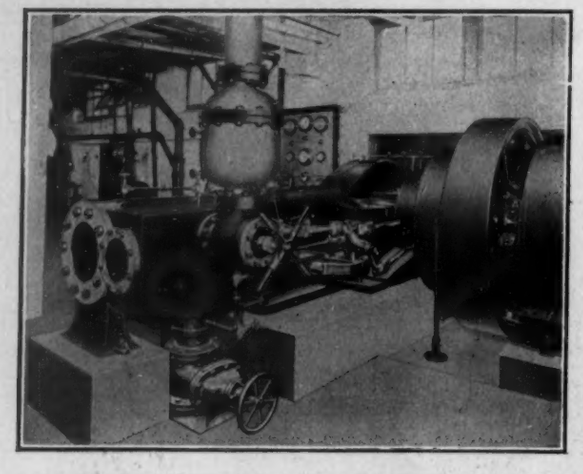

Illustration shows a BUCKEYE CLASS C SIMPLE STEAM ENGINE operating Non-Condensing, DIRECT CONNECTED TO D. C. GENERATOR.

Says a Master Mechanic:

"We must surely give the Buckeye people credit for knowing how to design an engine. As an illustration, in the seven years I have had charge of this plant we lost 45 minutes with our mill engine due to carelessness, and no time at all in our Power House Plant. One of our engines has run continuously, 23 hours per day for three years and is still doing it, without one cent of expense."

Buckeye Engines have a national reputation for reliability and efficiency. Years of practical engine building experience has developed the present type. The new type bed, refinement in detail, careful construction result in an engine which proves a paying investment for the customer. Engines for all classes of service.

When in need of power, write us.

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Builders of High Class Steam and Gas Engines

Special Specification Work
Pumping Engines
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Large Marine Boilers
to 16 feet in Diameter
Gen'l Contracting
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LAKE ERIE ENGINEERING WORKS

BUILD THE HIGHEST CLASS ENGINES OF ANY TYPE FOR SERVICE.
NO ENGINE, MACHINE, OR CASTING TOO HEAVY

Large Cast'gs and Machines to 50 Tons.—Turbine and Building Castings

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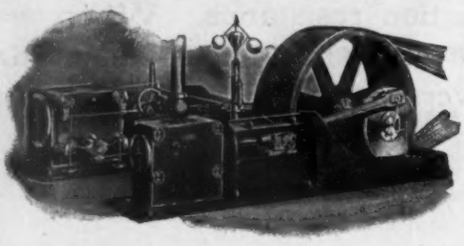
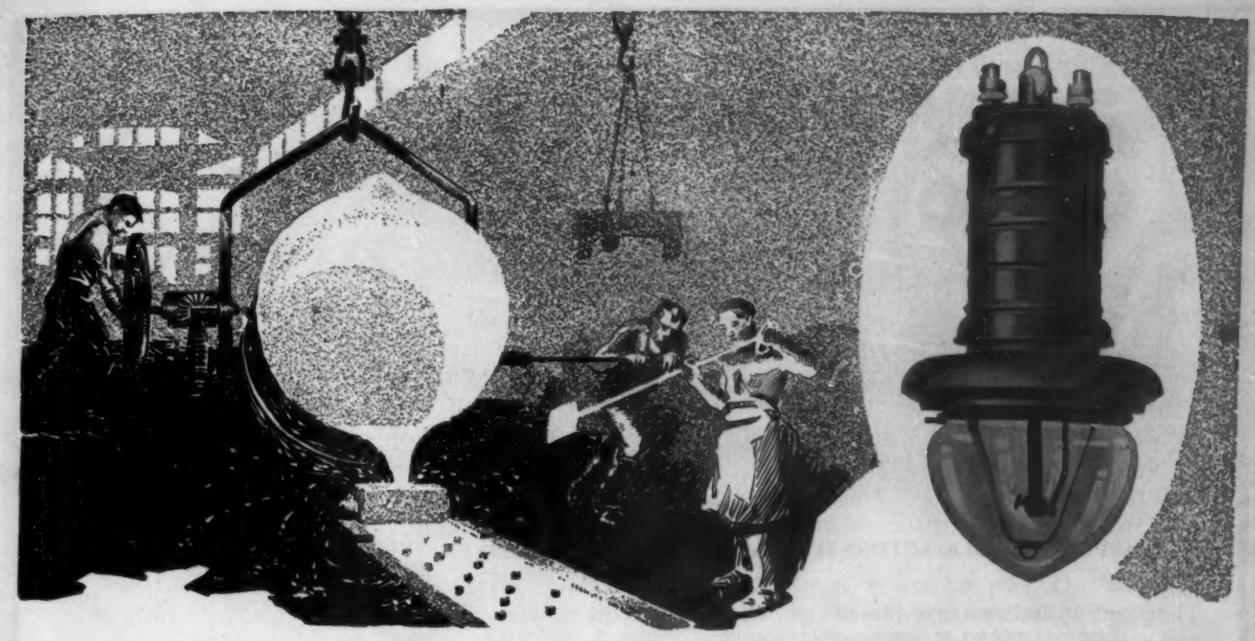


Steam Engines
Gas Engines
Special Power Machinery

THE C. & G. COOPER COMPANY, Engine Builders

We are interested in your power requirements. Write us.

Home Office and Works - Mt. Vernon, Ohio



Good Lighting Increases Production

LIGHT your plant ***well,*** so that the men can work as efficiently in artificial light as they can in daylight. With good illumination, accidents, shut-downs, delays, etc., are less likely to occur, and thus production is increased.

Further, in a well lighted plant, surroundings are more congenial and the men turn out better and quicker work.

Where a plant is well lighted, a marked increase in production from 2 to 15% is shown over an indifferently lighted plant.

Good lighting enables you to get first-rate working efficiency, 24 hours per day.

The Long Life GE Flame Arc Lamp

(Type W)

gives a wide distribution of brilliant light over large areas. It is one of the most powerful lighting units known. The lamp is exceptionally low in maintenance cost. On a multiple circuit it burns without attention for over 100 hours and even then it is necessary to renew only one electrode.

The absolute reliability of this new lamp insures a continuity of service.

Write for details regarding this remarkably efficient lamp.

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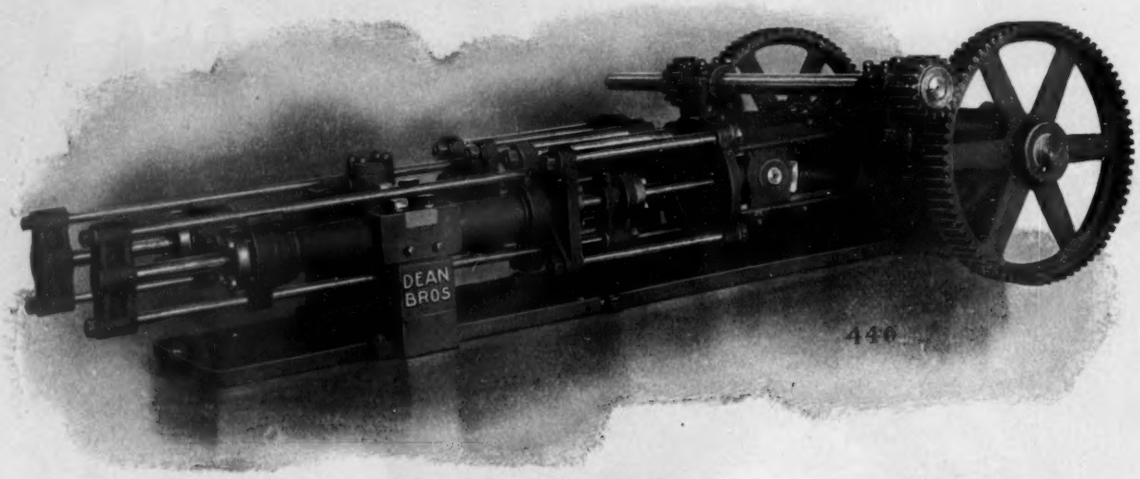
For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City
For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont.

3207



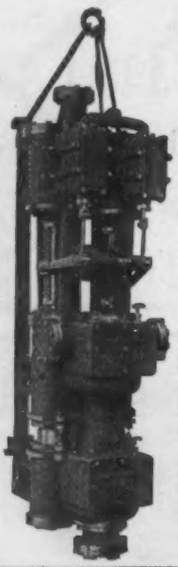
DUPLEX DOUBLE ACTING HYDRAULIC PUMP ARRANGED FOR BELT OR MOTOR DRIVE
(PATENTED)

The pump cylinders are of forged steel suitable for working pressures up to 10,000 lbs. per square inch and are ABSOLUTELY UNBREAKABLE. This pump is driven by gears at each end of the crank shaft. No power is transmitted from one crank to the other and torsion strains between cranks are eliminated. SEND FOR CATALOGUE NO. 84.

DEAN BROS. STEAM PUMP WORKS INDIANAPOLIS.

NOT IN THE PUMP TRUST

PRESCOTT SINKING PUMPS



take least shaft space of any pump of like capacity.

Do You Need a New Sinker?

Our Mine Pump Catalog P 22-26 is filled with information and data valuable to Mine Pump Users.

Write for a Copy.

Fred.M.Prescott Steam Pump Co.

115 Broadway New York Works: Milwaukee Wis.

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P140.2

Save Oil

and at the same time secure better lubrication by adding to your oil a small quantity of

DIXON'S FLAKE GRAPHITE

This is the one perfect solid lubricant. It is unaffected by the heat—even the intense generated in gas engine cylinders does not alter it. Write us.

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The Slogan of the Cameron---"Character: the Grandest Thing"

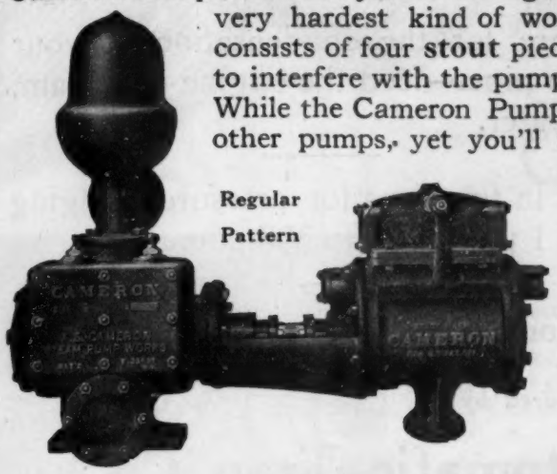
CAMERON PUMPS

ARE PLAIN WORK-A-DAY MACHINES

You won't find one unnecessary part in the Cameron Pump, and a glance at the cut shows its compact construction.

Cameron Pumps are built just as strong and simple as possible to be prepared for the very hardest kind of work. For instance, the Steam Mechanism consists of four **stout** pieces only, and there is no outside valve gear to interfere with the pump giving its very best service.

While the Cameron Pump competes only on a **quality** basis, with other pumps, yet you'll find a Cameron Pump still giving efficient service, after several "cheap" pumps have gone to pieces, proving that in **ultimate** economy Cameron Pumps also come out first.



Regular Pattern

Therefore, if you want to pay the lowest price for efficient service, install the Cameron. A trial will make you a satisfied user.

Catalog No. 4 illustrating and describing all types of Cameron Pumps, sent on request to interested pump users.

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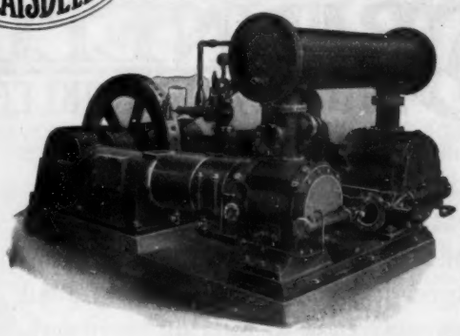

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Blaisdell Air Compressors are built to suit service conditions

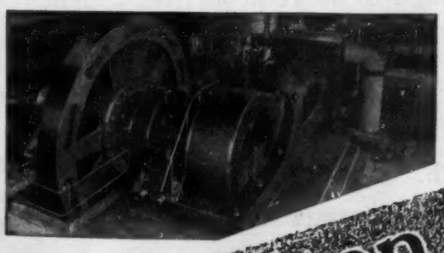
in a large number of types and of any size

These are the original self-oiling machines and stand first in the three great essentials---efficiency, economy and reliability. Compressed air is an absolute necessity and the machine that can serve you best bears the name Blaisdell. May we send particulars?

THE BLAISDELL MACHINERY COMPANY

Main Office and Works, BRADFORD, PA.

BLAISDELL BLAISDELL



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Hamilton Corliss Engines

Our claims are proved by the many rolling mill engines we have installed.

The ***ruggedness*** and ***efficiency*** of the "Hamilton" are unequaled.

Let us give you full information.

We also make a specialty of HEAVY REINFORCED ANVIL BLOCKS. Send for bulletin "1."

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to care for the condensation in your steam pipes---feed the engine dry steam, not water.

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Branch Offices: New York, Pittsburgh and Chicago

Manufacturers of the BROWN PYROMETER

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have operated successfully in more than 15,000 fires, have entirely extinguished two-thirds of these, and prevented the others from spreading, thus giving the firemen an easy task in putting them out. Fires under GRINNELL Automatic Sprinklers rarely get into the papers. They do not become big enough to make news items. The five minutes after the starting of a fire are absolutely vital. It is during this period that the sprinkler gives the fire its quenching shower bath.

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Freeman Water Tube Boilers

are a guarantee to you of immediate excellence of Boiler Service.
THEY PRODUCE RESULTS UNATTAINABLE WITH OTHER BOILERS

Scientifically designed—conscientiously constructed—it's impossible for you to get anything better.

Here are a few essential features:—For use with any kind of fuel with extreme economy. Thoroughly accessible for Cleaning, Examination and Repairs. Each tube can be removed individually without disturbing the remainder. Gives dry steam, and can be operated far in excess of its rated capacity. Has been proved to be of the highest efficiency. The maintenance expense is almost a negligible quantity. So designed that all parts are free to expand and contract without setting up injurious stresses in any portion of the structure. It is absolutely safe, and the result of 40 years' experience in the boiler business. Freeman Boilers always embody the latest ideas of the best engineers of this country. Write us at once for complete information.

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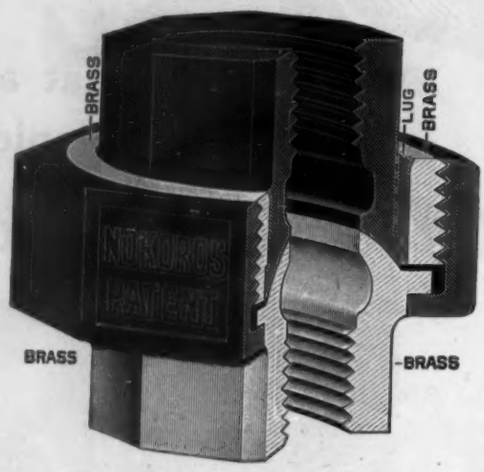
Water Jackets, Brick Hardening and Vulcanizing Cylinders, Steel Tanks, Self-Supporting Steel Chimneys, Stand Pipes, Smoke Connection and all kinds of Steel Plate Work and Riveted Steel.

These illustrations show a 600 H. P. Boiler *under erection, and fully erected,* at the plant of the Kelley-Racine Rubber Co., Racine, Wis., arranged for hand-firing.

The NOKOROS Union



1-2-3

The only Union with 3 Non-Corrosive Contact Points

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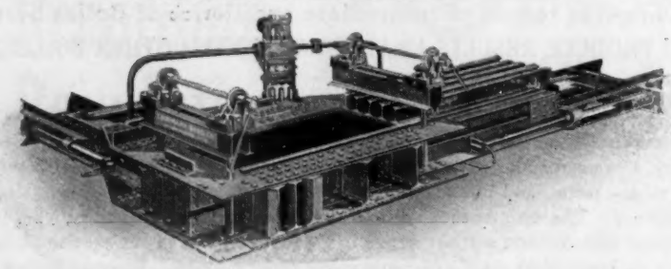
CONVERT LOOSE SCRAP INTO HEAVY MELTING STOCK

AND GREATLY ENHANCE ITS VALUE

Producers of Scrap Metals of all kinds will find this a remarkable machine



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Pays for itself in a short time.

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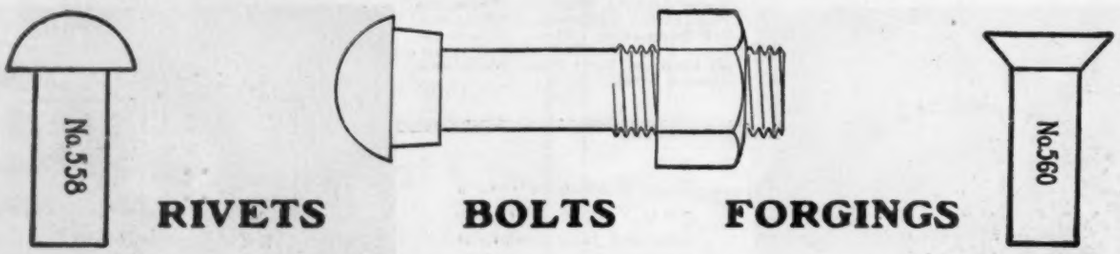

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NUTS **Pittsburgh. U. S. A.** **WASHERS**

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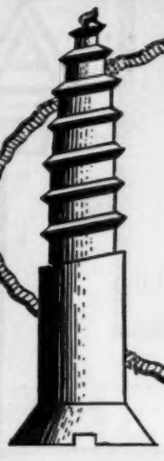

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Send for samples and test for yourself. Carefully manufactured from the best materials. *Any Length--Any Diameter*--guaranteed to give entire satisfaction.

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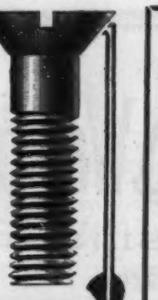

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Complete Line of
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Boxed for the
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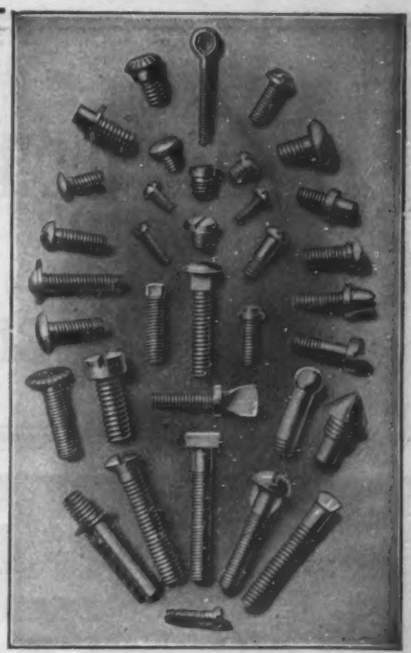

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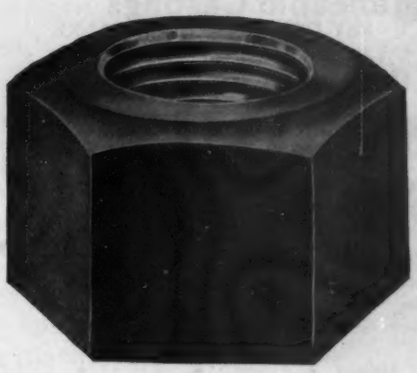

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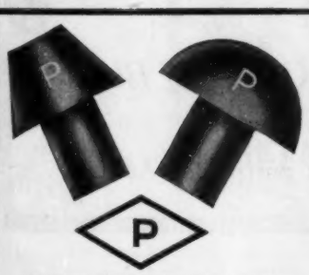

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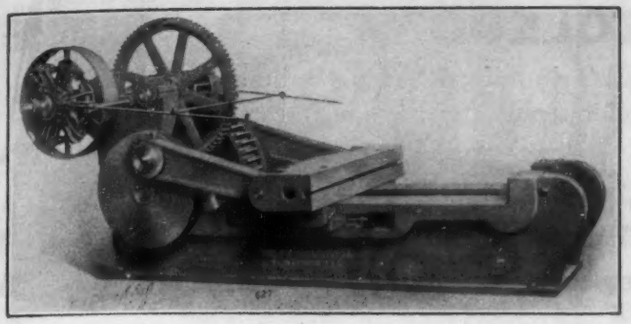

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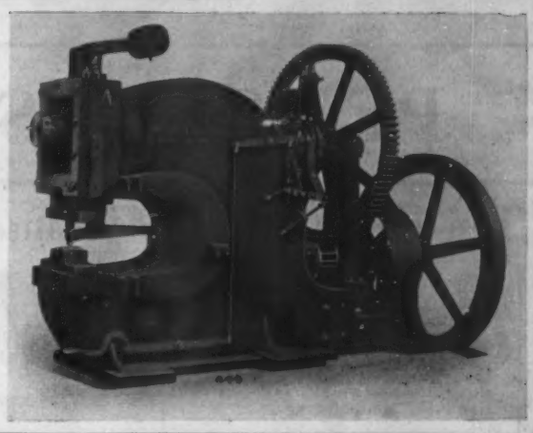

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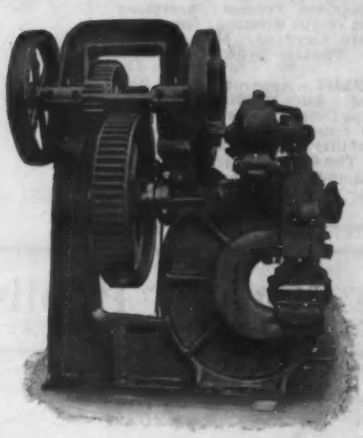

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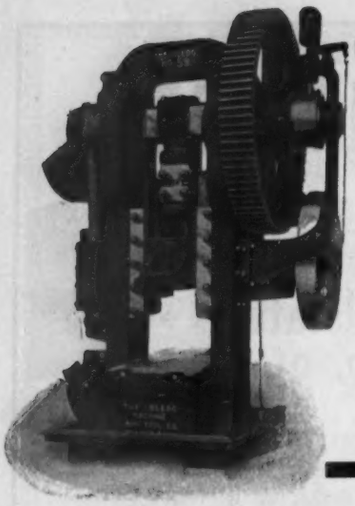

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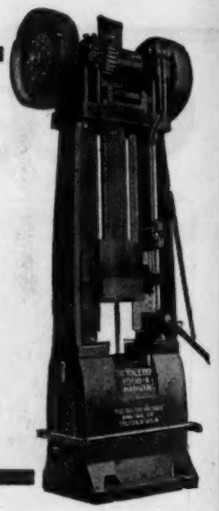

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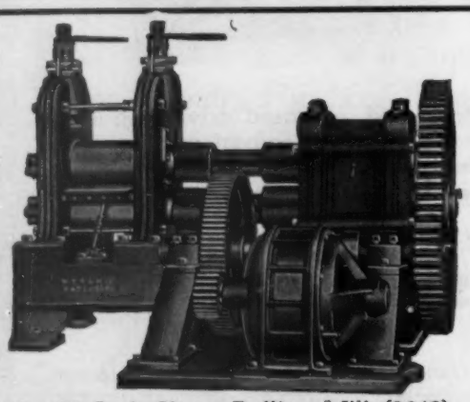

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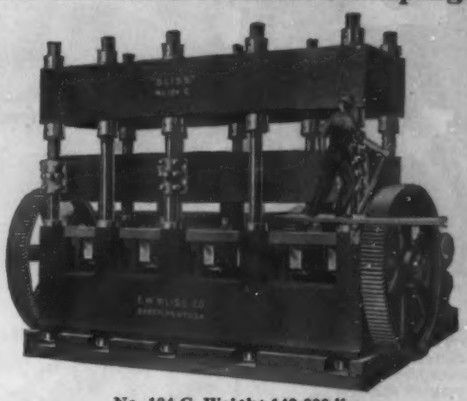

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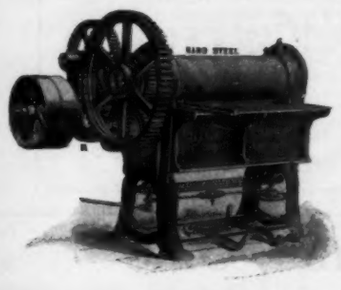

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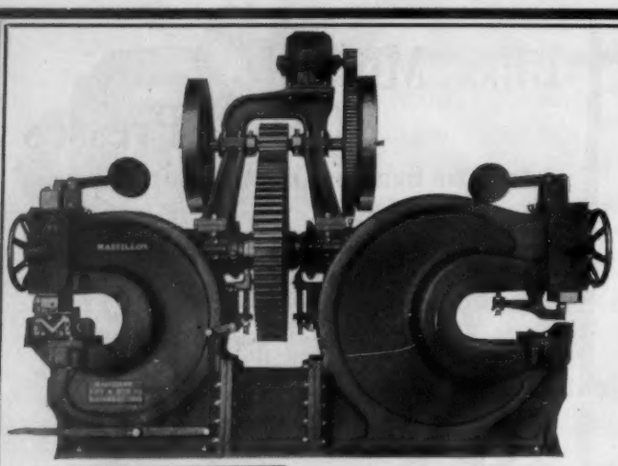

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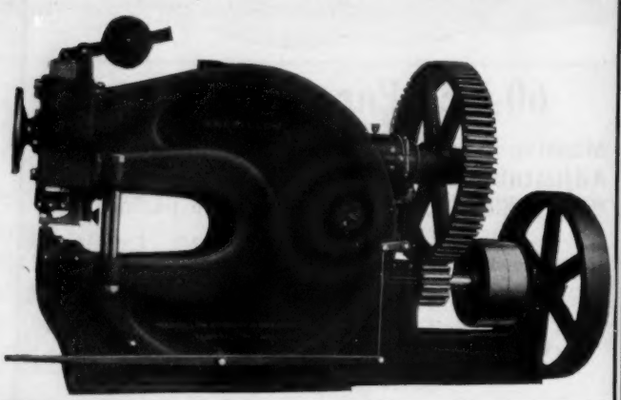

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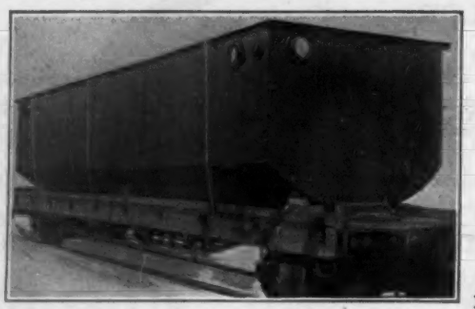

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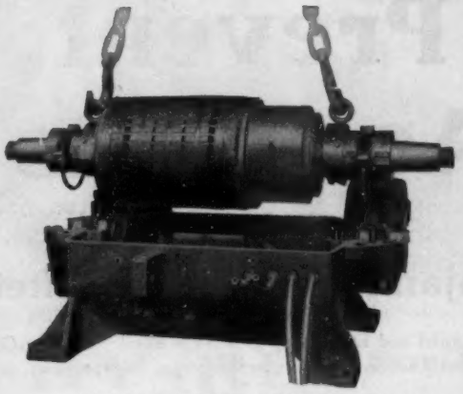

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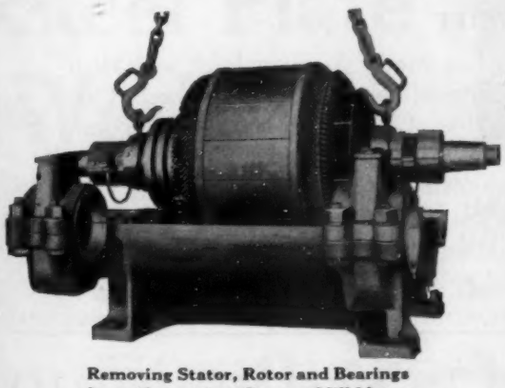

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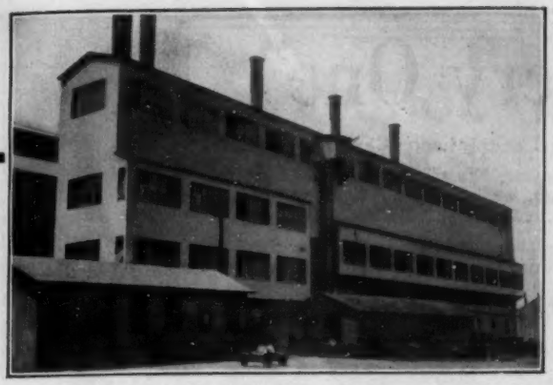

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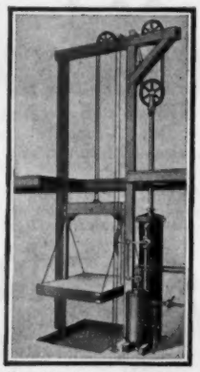

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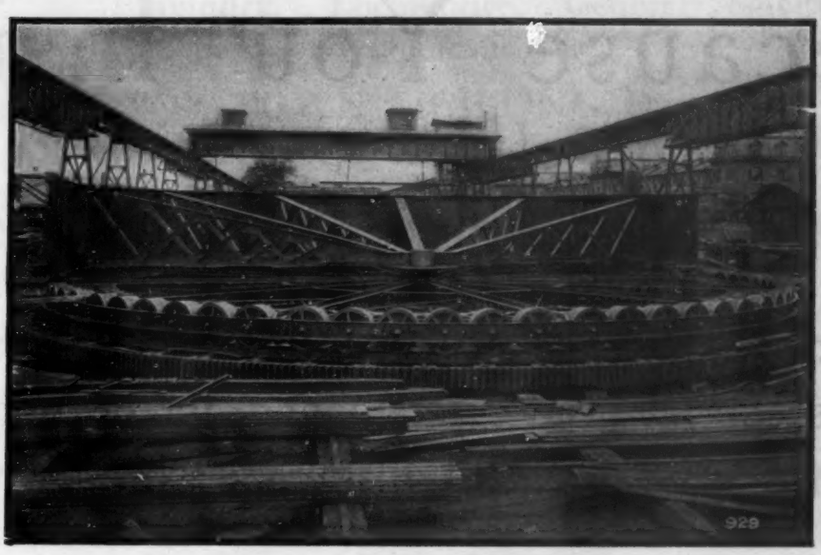

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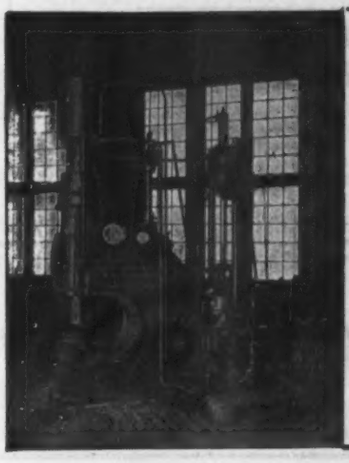

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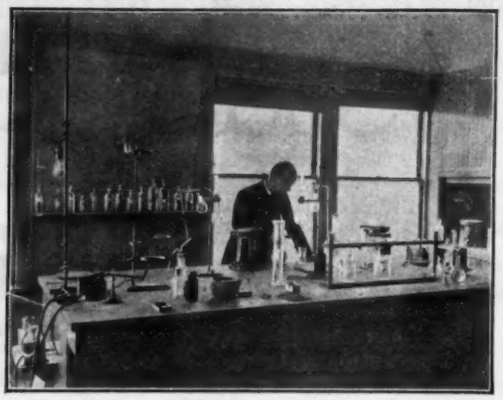

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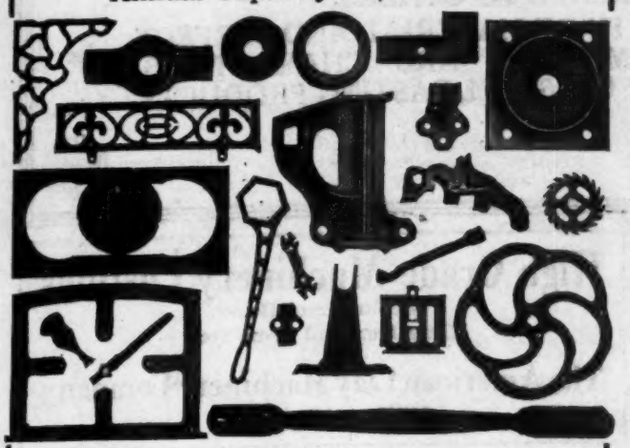

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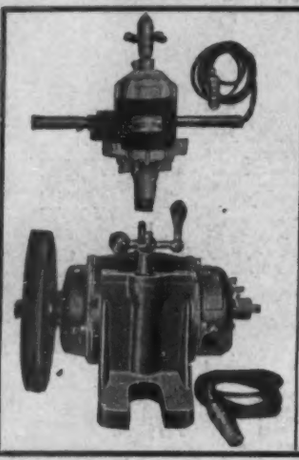

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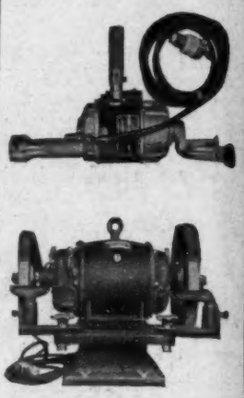

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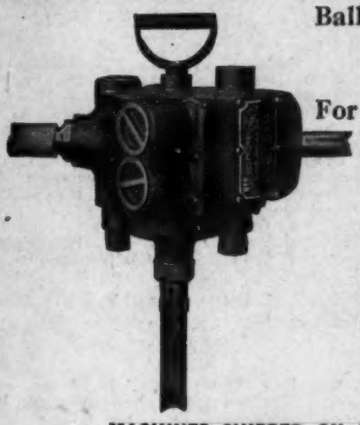

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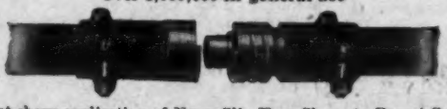

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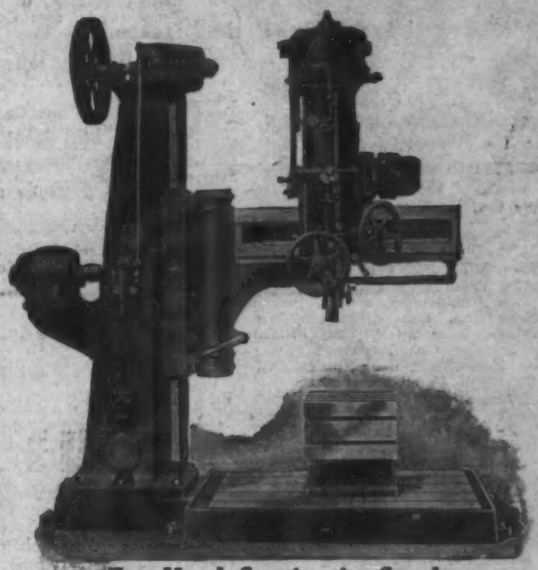

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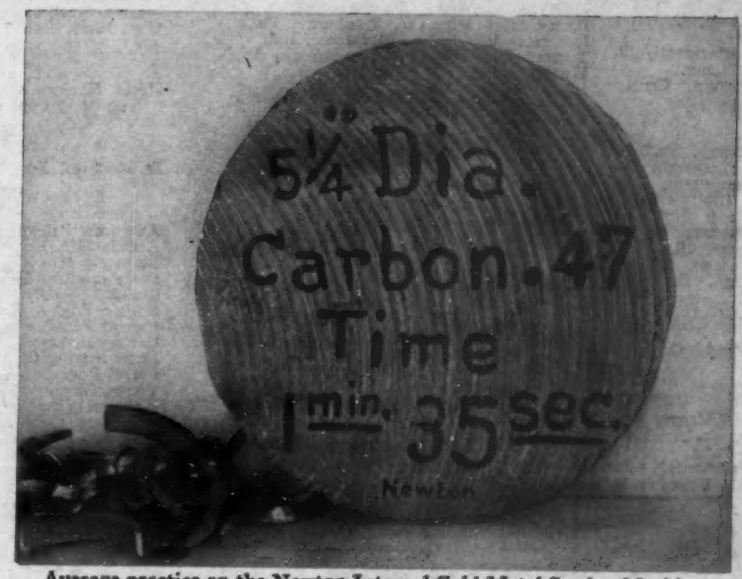

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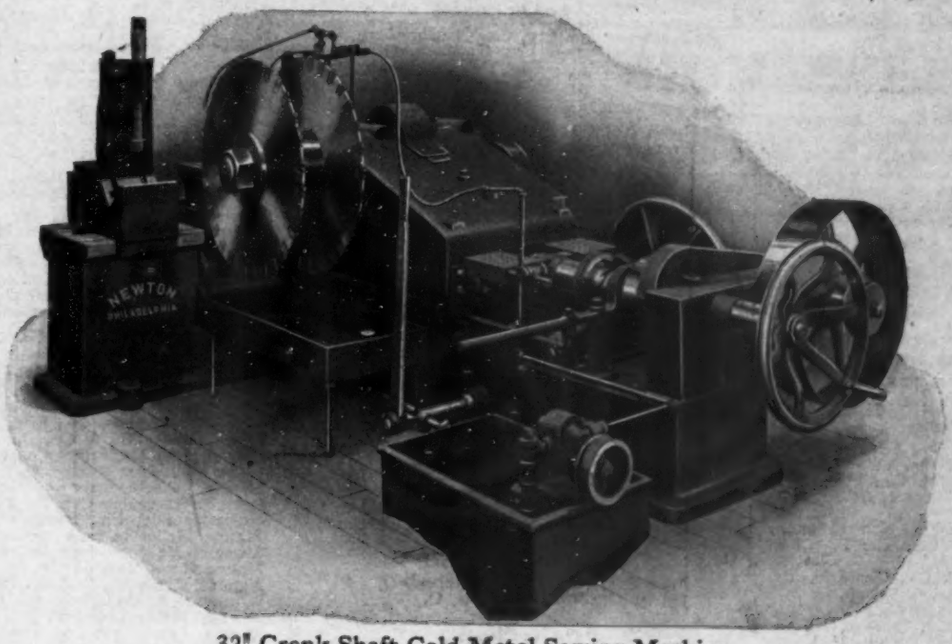

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BOILERS.

Cooper Co., C. & G., Mt. Vernon, O.
Freeman, S., & Sons Mfg. Co., Racine, Wis.
Lake Erie Engrg. Works, Buffalo, N. Y.
McKinnon Iron Works Co., The, Ashtabula, O.
Pennsylvania Boiler Works, Erie, Pa.
Sharon Boiler Works, Sharon, Pa.
Toomey, Frank, Philadelphia, Pa.

BOILER SETTINGS.
(Fire Brick.)

Pyro Clay Products Co., Oak Hill, O.

BOLTS.

American Bridge Co. of New York, New York.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Atlas Bolt & Screw Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Clark Bros. Bolt Co., Milldale, Conn.
Corbin Screw Corpn., New Britain, Conn.
Gary Screw & Bolt Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Milton Mfg. Co., Milton, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Rockford Bolt Co., Rockford, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.

BOOKS.

Penton Publishing Co., Cleveland, O.

BOXES.
(Annealing.)

Hubbard Steel Foundry Co., E. Chicago, Ind.
Mesta Machine Co., Pittsburgh, Pa.
National Mfg. Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wilfong Iron Works Co., M. F., Philadelphia.

BOXES.
(Shop.)

Sterling Wheelbarrow Co., West Allis, Wis.

BOXES.
(Sprue.)

Sterling Wheelbarrow Co., West Allis, Wis.

BRAKES.
(Disc.)

Cutler-Hammer Mfg. Co., Milwaukee, Wis

BRAKES.
(Electric.)

Electric Controller & Mfg. Co., Cleveland, O.
Toledo Bridge & Crane Co., Toledo, O.

BRAZING.
(Custom.)

Champion Rivet Co., Cleveland, O.

BREAKERS.
(Circuit.)

Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.

BREAKERS.
(Pig Iron.)

Brown Hoisting Machinery Co., Cleveland, O.

BRICK AND CLAY.
(Fire.)

Ashland Fire Brick Co., Ashland, Ky.
Bickford Fire Brick Co., Curwensville, Pa.
Big Savage Fire Brick Co., Frostburg, Md.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng
Brighton Fire Brick Co., New Brighton, Pa.
Brown Construction Co., The P. J., Cleveland, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
Ebsary, W. H., Buffalo, N. Y.
Garden City Sand Co., Chicago, Ill.
Holmes, F. B., & Co., Detroit, Mich.
Kier Fire Brick Co., Pittsburgh, Pa.
Knauff & Estabrook, Cleveland, O.
Louisville Fire Brick Wks., Highland Pk., Ky.
Ohio Fire Brick Co., Oak Hill, O.
Pyro Clay Products Co., Oak Hill, O.
Scioto Fire Brick Co., Sciotoville, O.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, O.
Tempest Brick Co., McKeesport, Pa.
Union Mining Co., Mt. Savage, Md.
Utica Fire Brick Co., Utica, Ill.

BRICK.
(Coke Oven.)

Pyro Clay Products Co., Oak Hill, O.

BRICK.
(Fire Arch.)

Pyro Clay Products Co., Oak Hill, O.

BRICK.
(Silica, Magnesia, Chrome.)

Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, O.

BRICK.
(Stove Blast Furnace.)

Big Savage Fire Brick Co., Frostburg, Md.
Kier Fire Brick Co., Pittsburgh, Pa.
Union Mining Co., Mt. Savage, Md.

BRIDGES AND VIADUCTS.
(Steel.)

American Bridge Co. of N. Y., New York.
Eichleay, John Jr., Co., Pittsburgh, Pa.
Lackawanna Bridge Co., Buffalo, N. Y.
McClintic-Marshall Const. Co., Pittsburgh, Pa.
McMyler Interstate Co., Cleveland, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Rochester Bridge Co., Rochester, Ind.
Trussed Concrete Steel Co., Detroit, Mich.
Worden-Allen Co., Chicago, Ill.

BRIQUETTING.

General Briquetting Co., New York City.

BRONZE.
(Vanadium.)

American Vanadium Co., Pittsburgh, Pa.

BRUSHES.
(Dynamo.)

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

BUCKETS.
(Clam Shell, Grab or Orange Peel for Coal and Ore.)

Andresen Evans Co., Chicago, Ill.
Blaw Steel Centering Co., Pittsburgh, Pa.
Brown Hoisting Machy. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Pawling & Harnischfeger Co., Milwaukee, Wis.

BUCKETS.
(Elevator and Hoisting.)

Bartlett, C. O., & Snow Co., Cleveland, O.
Hendrick Mfg. Co., Carbondale, Pa.
Illinois Malleable Iron Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUCKETS.
(Excavating.)

Andresen-Evans Co., Chicago, Ill.

BULLDOZERS.

Chambersburg Engrg. Co., Chambersburg, Pa.
Long & Allstatter Co., Hamilton, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BURRS.
(Rivet.)

Upson Nut Co., Cleveland, O.
Wrought Washer Mfg. Co., Milwaukee, Wis.

CABLEWAYS.

Brown Hoisting Machy. Co., Cleveland, O.
McClintic-Marshall Const. Co., Pittsburgh, Pa.

CANS.
(Waste or Shop.)

New Britain Mach. Co., New Britain, Conn.

CARS.
(Annealing, Charging, Pig Iron, Etc.)

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Elec. Locomotive & Car Co., West Park, O.
Mesta Machine Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

CARS.
(Coal, Coke and Mining.)

Atlas Car & Mfg. Co., Cleveland, O.
Elec. Locomotive & Car Co., West Park, O.
Jeffrey Mfg. Co., Columbus, O.
Massillon Fdy. & Machine Co., Massillon, O.
National Malleable Castings Co., Cleveland, O.

CARS.
(Electrically Driven.)

Atlas Car & Mfg. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.

CARS.
(Industrial.)

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Elec. Locomotive & Car Co., West Park, O.

CASING.
(Oil and Gas.)

National Tube Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

CASTINGS.
(Agricultural Implements.)

National Malleable Castings Co., Cleveland, O.

CASTINGS.
(Air Furnace.)

Tod Co., Wm., Youngstown, O.

CASTINGS.
(Auto.)

Erie Malleable Iron Co., Erie, Pa.
Interstate Foundry Co., Cleveland, O.

CASTINGS.
(Brass, Bronze and Aluminum.)

Arcade Mfg. Co., Freeport, Ill.
Dake Engine Co., Grand Haven, Mich.
Lancaster Fdy. Co., Lancaster, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Sterling Mach. & Stamping Co., Wellington, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS.
(Crucible Steel.)

Adrian Steel Casting Co., Adrian, Mich.
Baldwin Steel Co., New York, N. Y.
Chicago Steel Foundry Co., Chicago, Ill.
Prime Steel Co., Milwaukee, Wis.
Swedish Crucible Steel Co., Detroit, Mich.
Warren Steel Casting Co., St. Louis, Mo.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Die.)

Mesta Machine Co., Pittsburgh, Pa.
Strong Steel Fdy. Co., Buffalo, N. Y.

CASTINGS.
(Gear.)

Strong Steel Fdy. Co., Buffalo, N. Y.

CASTINGS.
(Gray Iron.)

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Arcade Mfg. Co., Freeport, Ill.
Bernstein Mfg. Co., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Blaisdell Machy. Co., Bradford, Pa.
Buffalo Fdy. & Machine Co., Buffalo, N. Y.
Carroll Foundry & Machine Co., Bucyrus, O.
Covington Machine Co., Covington, Va.
Dake Engine Co., Grand Haven, Mich.
Farrel Fdy. & Machine Co., Ansonia, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Interstate Foundry Co., Cleveland, O.
Johnston & Jennings Co., Cleveland, O.
Lancaster Fdy. Co., Lancaster, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Marshall Foundry Co., Pittsburgh, Pa.
National Foundry Co., Erie, Pa.
Ross-Meehan Fdy. Co., Chattanooga, Tenn.
Superior Foundry Co., Cleveland, O.
Taylor & Boggis Foundry Co., Cleveland, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Tod Co., Wm., Youngstown, O.
Union Foundry & Mach. Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
U. S. Cast Iron Pipe & Fdy. Co., New York.
Youngstown Fdy. & Mch. Co., Youngstown, O.

CASTINGS.
(Gray Iron, Car and Locomotive.)

Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Lake Erie Engrg. Works, Buffalo, N. Y.
National Foundry Co., Erie, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS.
(Gray Iron Machinery.)

American Clay Mchy. Co., The, Willoughby, O.
Davison-Namack Fdy. Co., Ballston Spa, N. Y.
Erie Foundry Co., Erie, Pa.
Interstate Foundry Co., Cleveland, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Superior Foundry Co., Cleveland, O.

CASTINGS.
(Malleable.)

Acme Steel & Mall. Iron Wks., Buffalo, N. Y.
Barlow Foundry Co., Newark, N. J.
Belle City Malleable Iron Co., Racine, Wis.
Erie Malleable Iron Co., Erie, Pa.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Galesburg Mall. Castings Co., Galesburg, Ill.
Globe Mall. Iron & Steel Co., Syracuse, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Lakeside Malleable Castings Co., Racine, Wis.
Lancaster Fdy. Co., Lancaster, Pa.
Marion Malleable Iron Works, Marion, Ind.
Missouri Malleable Iron Co., E. St. Louis, Mo.
Moline Malleable Iron Co., St. Charles, Ill.
National Malleable Castings Co., Cleveland, O.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
Union Malleable Iron Co., East Moline, Ill.
Waukesha Mall. Iron Co., Waukesha, Wis.
Wisconsin Malleable Iron Co., Milwaukee, Wis.

CASTINGS.
(Malleable, Car and Locomotive.)

Lakeside Malleable Castings Co., Racine, Wis.
Marion Malleable Iron Works, Marion, Ind.
Missouri Malleable Iron Co., E. St. Louis, Ill.
National Malleable Castings Co., Cleveland.
Pratt & Letchworth Co., Buffalo, N. Y.

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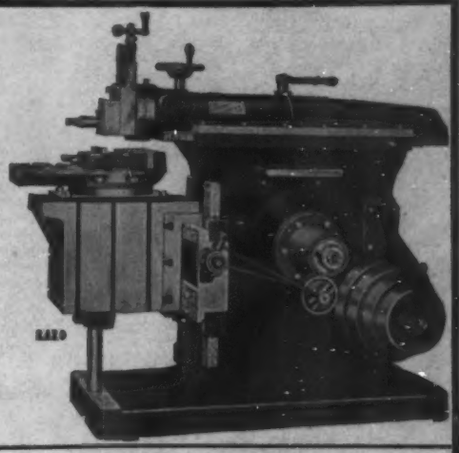

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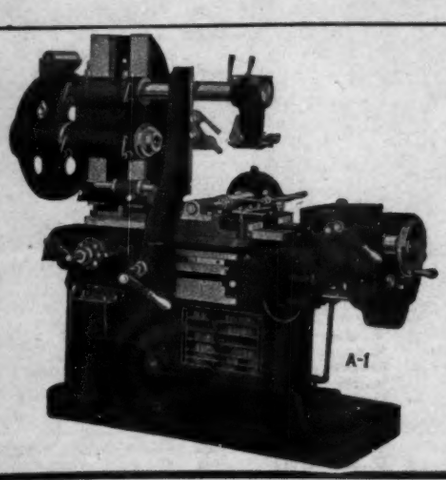

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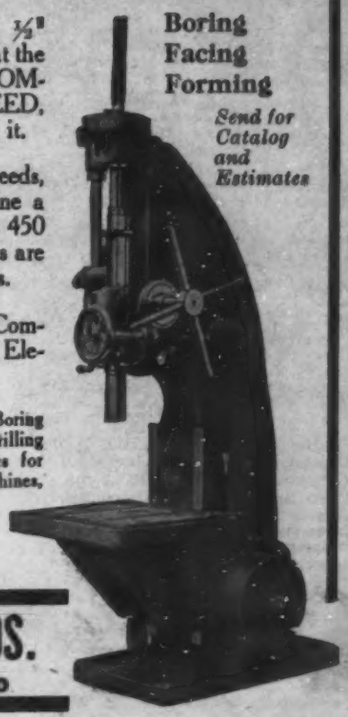

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Tod Co., Wm., Youngstown, O.
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Federal Steel Foundry Co., Chester, Pa.
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Racine Steel Castings Co., Racine, Wis.
Scullin-Gallagher Iron & Steel Co., St. Louis.
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St. Louis Steel Fdy., St. Louis, Mo.
Strong Steel Fdry. Co., Buffalo, N. Y.
Swedish Crucible Steel Co., Detroit, Mich.
United Engineering & Fdy. Co., Pittsburgh, Pa.
Warren Steel Casting Co., St. Louis, Mo.
West Steel Casting Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

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Carroll Foundry & Machine Co., Bucyrus, O.
Hubbard Steel Fdy. Co., East Chicago, Ind.
National Foundry Co., Erie, Pa.
Otis Steel Co., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Scullin-Gallagher Iron & Steel Co., St. Louis.

CASTINGS.
(Steel Converter.)

Chicago Steel Foundry Co., Chicago, Ill.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Steel Electrical.)

Smith, Geo. H., Steel Casting Co., Milwaukee.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Steel Machinery.)

American Steel Foundries, Chicago, Ill.
Chicago Steel Foundry Co., Chicago, Ill.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Mesta Machine Co., Pittsburgh, Pa.
Scullin-Gallagher Iron & Steel Co., St. Louis.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS.
(Stove Plate.)

Interstate Foundry Co., Cleveland, O.

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(Vanadium.)

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Hubbard Steel Fdy. Co., East Chicago, Ind.

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Morse Chain Co., Ithaca, N. Y.
Steel Car Forge Co., Pittsburgh, Pa.
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Champion Mach. & Forging Co., Cleveland, O.
Cheney & Son, S., Manlius, N. Y.
Gem Mfg. Co., Pittsburgh, Pa.

CHARCOAL.

Hillman, J. H., & Son, Pittsburgh, Pa.

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(General.)

Contact Process Co., Buffalo, N. Y.
General Chemical Co., Cleveland, O.

CHIMNEYS.

Riter-Conley Mfg. Co., Pittsburgh, Pa.

CLAMPS.

National Tube Co., Pittsburgh, Pa.
Never Slip Safety Clamp Co., New York, N. Y.
Starrett, L. S., Co., Athol, Mass.

CLAY.
(Fire Ground.)

Big Savage Fire Brick Co., Frostburg, Md.
Cleo Clay Products Co., Oak Hill, O.
Union Mining Co., Mt. Savage, Md.

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(Friction.)

Carlyle-Johnson Machine Co., Manchester, Ct.

CLUTCHES.
(Magnetic.)

Cutler-Hammer Clutch Co., Milwaukee, Wis.

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Brier Hill Steel Co., The, Youngstown, O.
Columbus Iron & Steel Co., Columbus, O.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Son, Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Pickands, Brown & Co., Chicago, Ill.
Pittsburgh-Westmoreland Coal Co., Pittsburgh.
Quigley Furn. & Fdy. Co., Springfield, Mass.
Rainey, W. J., New York City.
Rogers, Brown & Co., Cincinnati, O.
Semet-Solvay Co., Detroit, Mich.
Sunshine Coal & Coke Co., Uniontown, Pa.
Tenn. Coal, Iron & R. R. Co., B'm'ghm, Ala.
Walter-Wallingford & Co., Cincinnati, O.
Washington Coal & Coke Co., Pittsburgh, Pa.

COILS.

Acme Steel Goods Co., Chicago, Ill.

COILS.
(Pipe.)

National Tube Co., Pittsburgh, Pa.

COKE.

Baird & West, Detroit, Mich.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Eaton, Rhodes & Co., Cincinnati, O.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Son, Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., & Son, Philadelphia, Pa.
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Pioneer Coal & Coke Co., St. Louis, Mo.
Producers Coke Co., Uniontown, Pa.
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Walter-Wallingford & Co., Cincinnati, O.
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COKE PUSHERS.

Koppers Co., H., Chicago, Ill.

COMPRESSORS.
(Air.)

American Compressor & Pump Co., Baltimore.
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Blaisdell Machy. Co., Bradford, Pa.
Dean Bros. Steam Pump Wks., Indianapolis.
General Electric Co., Schenectady, N. Y.
Heisler Co., The, St. Marys, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
Ingersoll-Rand Co., New York.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
National Brake & Elec. Co., Milwaukee, Wis.
Norwalk Iron Works Co., So. Norwalk, Conn.

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(Gas.)

Ingersoll-Rand Co., New York.
Norwalk Iron Works Co., So. Norwalk, Conn.

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(Steam, Jet and Surface.)

Cameron, A. S., Steam Pump Wks, New York
Cooper, C. & G., Co., Mt. Vernon, O.
Dean Bros. Steam Pump Wks., Indianapolis.
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Struthers-Wells Co., Warren, Pa.

CONSTRUCTION.
(By-Product Coke Ovens.)

Koppers Co., H., Chicago, Ill.

CONSTRUCTION.
(Concrete.)

Kratzer, W. N., & Co., Pittsburgh, Pa.
Trussed Concrete Steel Co., Detroit, Mich.

CONSTRUCTION.
(Steel and Iron.)

Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Eichleay, John, Jr., Co., Pittsburgh, Pa.
Freeman, S., & Sons Mfg. Co., Racine, Wis.
Kratzer, W. N., & Co., Pittsburgh, Pa.
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McMyler Interstate Co., Cleveland, O.
Meehan Boiler & Const. Co., Lowellville, O.
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Sharon Boiler Works, Sharon, Pa.

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Graver Tank Wks., Wm., East Chicago, Ind.
Hibben & Co., So. Chicago, Ill.
Struthers-Wells Co., Warren, Pa.

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Pittsburgh Valve, Fdy. & Const. Co., Pittsburgh

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(Electric.)

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Electric Controller & Mfg. Co., Cleveland, O.
Toledo Bridge & Crane Co., Toledo, O.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

CONTROLLERS.
(Boiler Feed and Open Heater Feed.)

Strong, Carlisle & Hammond Co., Cleveland, O.

CONVERTERS.
(Steel Casting.)

Whiting Foundry Equip. Co., Harvey, Ill.

CONVEYORS.

Bartlett, C. O., & Snow Co., Cleveland, O.
Jeffrey Mfg. Co, Columbus, O.
McMyler Interstate Co., Cleveland, O.

COUNTERSHAFTS.
(Variable Speed.)

Norton Co., Worcester, Mass.

COUPLINGS.

Jones & Laughlin Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.

COUPLINGS.
(Flexible.)

Electric Controller & Mfg. Co., Cleveland, O.

CRANES.
(Charging.)

Alliance Machine Co., Alliance, O.
Morgan Engineering Co., Alliance, O.
Pawling & Harnischfeger Co., Milwaukee, Wis.

CRANES.
(Electric Traveling.)

Alliance Machine Co., Alliance, O.
Browning, Victor R., Co., Cleveland, O.
Brown Hoisting Machy. Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Ridgway, Craig & Son, Coatesville, Pa.
Shaw Electric Crane Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Gantry.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Mchy. Co., Cleveland, O.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.

CRANES.
(Grab Bucket.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machy. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.
Pawling & Harnischfeger, Co., Milwaukee, Wis.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Hand Traveling.)

Browning, Victor R., Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
Industrial Works, Bay City, Mich.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Hand Trolley.)

Brown Hoisting Machinery Co., Cleveland, O.

CRANES.
(Hydraulic.)

Alliance Machine Co., Alliance, O.
Morgan Engineering Co., Alliance, O.

CRANES.
(Ingot Stripper.)

Alliance Machine Co., Alliance, O.
Morgan Engineering Co., Alliance, O.
Pawling & Harnischfeger Co., Milwaukee, Wis

WHERE TO BUY

CRANES.
(Jib.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machy. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Ridgway, Craig & Son, Coatesville, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Locomotive.)

Brown Hoisting Machy. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

CRANES.
(Pneumatic.)

Detroit Hoist & Machy. Co., Detroit, Mich.
Industrial Works, Bay City, Mich.
Northern Engineering Works, Detroit, Mich.

CRANES.
(Special.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machy. Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
Industrial Works, Bay City, Mich.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Shaw Electric Crane Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CRANES.
(Steam and Pneumatic, Wire Mills.)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRANK SHAFTS.

Kropp Forge Co., Chicago, Ill.

CRUCIBLES.

Dixon, Joseph, Crucible Co., Jersey City, N. J.

CUPOLAS.

Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPRO.
(Vanadium.)

American Vanadium Co., Pittsburgh, Pa.

CUPS.
(Grease.)

McKinnon Iron Works Co., The, Ashtabula, O.

CUTTERS.

Landis Tool Co., Waynesboro, Pa.

CUTTERS.
(Coal.)

Ingersoll-Rand Co., New York.

CUTTERS.
(Milling.)

Morse Twist Drill & Mch. Co., New Bedford, Mass.

CUTTING.
(Oxy-Acetylene Process.)

International Oxygen Co., New York City.
Oxweld Acetylene Co., Chicago, Ill.

CYLINDERS.

American Vanadium Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.

DERRICKS.

Dake Engine Co., Grand Haven, Mich.

DIES.

Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Long & Allstatter Co., Hamilton, O.
Toledo Machine & Tool Co., Toledo, O.

DIE-PLATES AND WORLDES.
(Steel, Wire Mills.)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

DREDGES.

Bucyrus Co., South Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.

DRESSERS.
(Emery Wheel.)

Norton Co., Worcester, Mass.

DRILLS.
(Electric.)

Cincinnati Electrical Tool Co., Cincinnati, O.
Hisey-Wolf Machine Co., Cincinnati, O.
U. S. Electrical Tool Co., Cincinnati, O.
Van Dorn & Dutton Co., Cleveland, O.

DRILLS.
(Pneumatic.)

Allen, John F., Co., New York City.
Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.

DRILLS.
(Portable.)

Hisey-Wolf Machine Co., Cincinnati, O.
Newton Mch. Tool Wks. Inc., Philadelphia.
U. S. Electrical Tool Co., Cincinnati, O.

DRILLS.
(Rock.)

Ingersoll-Rand Co., New York.

DRILLS.
(Sensitive and Upright.)

Fox Machine Co., Grand Rapids, Mich.

DRILLS.
(Twist.)

Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Ryerson, Jos. T., & Son, Chicago, Ill.

DRIVERS.
(Pile.)

Industrial Works, Bay City, Mich.

DYNAMOS.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

ELECTRICAL EQUIPMENT.
(Second Hand.)

McCoy & Brandt, Pittsburgh, Pa.

ELECTRICAL INSTRUMENTS.
(Repaired and Tested.)

Stupakoff Laboratories, Pittsburgh, Pa.

ELEVATORS.

Ridgway, Craig, & Son, Coatesville, Pa.

ENAMELING.
(Porcelain.)

Geuder, Paeschke & Frey Co., Milwaukee.

ENGINEERS AND CONTRACTORS.

American Bridge Co. of New York, New York
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Blair Engrg. Co., Chicago, Ill.
Brown, The P. J. Construction Co., Cleveland, O.
Carroll Foundry & Machine Co., Bucyrus, O.
Ebsary, W. H., Buffalo, N. Y.
Eichleay, John, Jr., Co., Pittsburgh, Pa.
Hibben & Co., So. Chicago, Ill.
Kennedy, Julian, Pittsburgh, Pa.
Koppers Co., H., Chicago, Ill.
Lackawanna Bridge Co., Buffalo, N. Y.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engrg. Works, Buffalo, N. Y.
Laughlin, Alex., & Co., Pittsburgh, Pa.
McClintic-Marshall Const. Co., Pittsburgh, Pa.
McClure, Geo. W., Son & Co., Pittsburgh, Pa.
McKee, Arthur G., Cleveland, O.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Osborn Enginering Co., Cleveland, O.
Rockwell Furnace Co., New York City.
Shaw-Kendall Engrg. Co., Toledo, O.
Smythe, The S. R. Co., Pittsburgh, Pa.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Union Fdy. & Mach. Co., Pittsburgh, Pa.
United Engineering & Fdy. Co., Pittsburgh, Pa.
Wellman, S. T., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Worden-Allen Co., Chicago, Ill.

ENGINEERS AND CONTRACTORS.
(By-Product Coke Ovens.)

Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

ENGINE STOPS.

Locke Regulator Co., Salem, Mass.
Strong, Carlisle & Hammond Co., Cleveland.

ENGINES.
(Blowing.)

Hooven, Owens, Rentschler Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Gas, Gasoline and Oil.)

Buckeye Engine Co., Salem, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Otto Gas Engine Wks., Philadelphia, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Hoisting.)

Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Mesta Machine Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkesbarre, Pa.

ENGINES.
(Pneumatic.)

Detroit Hoist & Machine Co., Detroit, Mich.

ENGINES.
(Pumping.)

Heisler Co., The, St. Marys, O.
Hooven, Owens, Rentschler Co., Hamilton, O.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Steam.)

Buckeye Engine Co., Salem, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Hooven, Owens, Rentschler Co., Hamilton, O.
Lake Erie Engrg. Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.

EQUIPMENT.
(By-Product Coke Oven.)

Koppers Co., H., Chicago, Ill.

EQUIPMENT.
(Rolling Mill.)

Bertsch & Co., Cambridge City, Ind.
Carroll Foundry & Machine Co., Bucyrus, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

EQUIPMENT.
(Welded Chain, Wire and Wire Nail Mills—Complete.)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

EXTRACTORS.
(Steam or Oil.)

Strong, Carlisle & Hammond Co., Cleveland.

FACINGS.
(Foundry.)

Dixon, Jos., Crucible Co., Jersey City, N. J.

FACTORY SITES.

Connellsville Cham. of Com., Connellsville, Pa.

FENCE.
(Woven Wire.)

American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Johnstown, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

FERRO-MANGANESE.

Blackwell, Geo. G., & Sons, Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.

FERRO-SILICON.

Blackwell, Geo. G., & Sons, Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Tennessee Coal, Iron & R. R. Co., B'mg'm, Ala.

FERRO.
(Vanadium.)

American Vanadium Co., Pittsburgh, Pa.

FILES.

Barnett, G. & H., Co., Philadelphia, Pa.
Disston & Sons, Inc., Henry, Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILTERS.
(Oil.)

Eichleay, Jr., Co., John, Pittsburgh, Pa.

FIRE EXTINGUISHING APPARATUS.

General Fire Extinguisher Co., Providence, R. I.

FITTINGS.
(Pipe.)

Illinois Malleable Iron Co., Chicago, Ill.
Massillon Iron & Steel Co., Massillon, O.
National Tube Co., Pittsburgh, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Pittsburgh Valve, Fdy. & Cons. Co., Pittsburg
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FLANGES.

Dart, E. M., Mfg. Co., Providence, R. I.
Hubbard Steel Foundry Co., E. Chicago, Ind.
National Tube Co., Pittsburgh, Pa.
Sundberg Co., J. A., Chicago, Ill.

FLASKS.

Sterling Wheelbarrow Co., West Allis, Wis.

WHERE TO BUY

FLOORING.
(Bridge.)
Youngstown Iron & Steel Co., Youngstown, O.

FLOORING.
(Creosoted Wood.)
Ayer & Lord Tie Co., Chicago, Ill.

FLUOR-SPAR.
Rogers, Brown & Co., Cincinnati, O.

FLY WHEELS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.

FORGINGS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Vanadium Co., Pittsburgh, Pa.
Anderson Forge & Mach. Co., Detroit, Mich.
Baldwin Steel Co., New York, N. Y.
Bethlehem Steel Co., So. Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Champion Machine & Forging Co., Cleveland.
Columbus Forge & Iron Co., Columbus, O.
Crucible Steel Forge Co., Cleveland, O.
Horsburgh Forgng Co., Cleveland, O.
Ingalls-Shepard Forging Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Kropp Forge Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.
Otis Steel Co., Cleveland, O.
Pollak Steel Co., Cincinnati, O.
Rockford Drop Forge Co., Rockford, Ill.
Smith, A. O., Co., Milwaukee, Wis.
Steel Car Forge Co., Pittsburgh, Pa.
Sundberg Co., J. A., Chicago, Ill.

FORGINGS.
(Auto.)
Anderson Forge & Mach. Co., Detroit, Mich.
General Drop Forge Co., Buffalo, N. Y.
Kropp Forge Co., Chicago Ill.
Martin Forging Co., H. J., Indianapolis, Ind.

FORGINGS.
(Car and Locomotive.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Andrews Steel Co., Newport, Ky.
Cambria Steel Co., Johnstown, Pa.
Cleveland City Forge & Iron Co., Cleveland.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Steel Car Forge Co., Pittsburgh, Pa.

FORGINGS.
(Copper and Alloy Steel.)
Anderson Forge & Mach. Co., Detroit, Mich.
Kropp Forge Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.

FORGINGS.
(Drop.)
Anderson Forge & Mach. Co., Detroit, Mich.
Champion Machine & Forging Co., Cleveland.
Columbus Forge & Iron Co., Columbus, O.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Rockford Drop Forge Co., Rockford, Ill.
Smith, A. O., Co., Milwaukee, Wis.
Steel Car Forge Co., Pittsburgh, Pa.
Western Drop Forge Co., Marion, Ind.

FOUNDRY EQUIPMENT AND SUPPLIES.
(Iron and Brass.)
Arcade Mfg. Co., Freeport, Ill.
Kelly, T. P., & Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Peterson-National Co., Chicago, Ill.
Sly Mfg. Co., W. W., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES.
(Annealing.)
General Electric Co., Schenectady, N. Y.
Hagan, George J., Pittsburgh, Pa.
Rockwell Furnace Co., New York.
Swindell & Bros., Wm., Pittsburgh, Pa.

FURNACES.
(Blast.)
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engrg. Wks., Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
McClure, Son & Co., G. W., Pittsburgh, Pa.
McKee, Arthur G., Cleveland, O.
Meehan Boiler & Const. Co., Lowellville, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Smythe Co., S. R., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.
Tod Co., Wm., Youngstown, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

FURNACES.
(Brass and Copper Melting.)
Rockwell Furnace Co., New York.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Crucible.)
Laughlin & Co., Alex., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Electrically Heated.)
Bristol Co., Waterbury, Conn.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Forging.)
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Lead, Pot and Muffle Annealing, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES.
(Melting.)
Rockwell Furnace Co., New York, N. Y.
Strong, Carlisle & Hammond Co., Cleveland.
Whiting Foundry Equip. Co., Harvey, Ill.

FURNACES.
(Oil, Gas or Coke. Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES.
(Reheating.)
Morgan Construction Co., Worcester, Mass.

FURRING.
(Metal.)
Youngstown Iron & Steel Co., Youngstown.

GALVANIZING.
(Custom.)
Geuder, Paeschke & Frey Co., Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
McCance Bros. Co., Pittsburgh, Pa.

GASKETS.
Erbestos Brake Lining Co., Philadelphia, Pa.

GAUGES.
(Recording and Steam.)
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

GEAR CUTTING.
Newton Machine Tool Wks., Philadelphia, Pa.
Tod Co., Wm., Youngstown, O.

GEARS.
Allen, Edgar, Amer. Manganese Steel Co., Chicago, Ill.
Bilgram Machine Works, Philadelphia, Pa.
Boston Gear Works, Norfolk Downs, Mass.
Bucyrus Steel Casting Co., Bucyrus, O.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Dake Engine Co., Grand Haven, Mich.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Gleason Wks., Rochester, N. Y.
Horsburgh & Scott Co,, Cleveland, O.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
Union Foundry & Machine Co., Pittsburgh.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Van Dorn & Dutton Co., Cleveland, O.

GEARS.
(Bevel.)
Boston Gear Works, Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Hubbard Steel Fdy. Co., East Chicago, Ind.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.

GEARS.
(Cast Steel, Machine Molded.)
American Steel Foundries, Chicago, Ill.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Nuttall, R. D., Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

GEARS.
(Cut.)
Boston Gear Works, Norfolk Downs, Mass.
Carroll Foundry & Machine Co., Bucyrus, O.
Chicago Rawhide Mfg. Co., Chicago. Ill.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
Van Dorn & Dutton Co., Cleveland, O.

GEARS.
(Double Helical Cut.)
Tod Co., Wm., Youngstown, O.

GEARS.
(Rawhide.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.

GEARS.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Mesta Machine Co., Pittsburgh, Pa.

GENERATORS.
(Direct and Alternating.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

GLASSES.
(Gage Boiler.)
Strong, Carlisle & Hammond Co., Cleveland.

GOVERNORS.
(Pump.)
Strong, Carlisle & Hammond Co., Cleveland.

GRAPHITE.
Dixon Crucible Co., Jos., Jersey City, N. J.
Ilsley, Doubleday & Co., New York City.

GRATES.
Green Engrg. Co., Chicago, Ill.

GRINDERS.
(Chain Die, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Electrical.)
Cincinnati Electrical Tool Co., Cincinnati, O.
Hisey-Wolf Machine Co., Cincinnati, O.

GRINDERS.
(Nail, Machine Knife, Wire Nail Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.

GRINDERS.
(Swing Frame.)
Pittsburgh Emery Wheel Co., Pittsburgh, Pa.

GUARDS.
(Machinery for Prevention of Accidents.)
Geuder, Paeschke & Frey Co., Milwaukee.

HAMMERS.
(Belt Driven.)
Bradley & Son, C. C., Syracuse, N. Y.

HAMMERS.
(Drop.)
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Long & Allstatter Co., Hamilton, O.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mach. Co., Waterbury, Conn.

HAMMERS.
(Foot and Power, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

HAMMERS.
(Drop-Forging.)
Toledo Machine & Tool Co., Toledo, O.

HAMMERS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O
Ryerson, Joseph T., & Son, Chicago, Ill.

HAMMERS.
(Power.)
Beaudry & Co., Inc., Boston, Mass.
Bradley & Son, C. C., Syracuse, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Toledo Machine & Tool Co., Toledo, O.

HAMMERS.
(Steam.)
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.

HAMMERS.
(Steam Gravity Drop.)
Massillon Fdy. & Mach. Co., Massillon, O.

WHERE TO BUY

HANGERS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

HEADS.
(Dished.)
Worth Bros. Co., Coatesville, Pa.

HEATERS.
(Feed Water.)
Shaw-Kendall Engrg. Co., Toledo, O.

HOISTS.
(Chain.)
Chisholm & Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.

HOISTS.
(Compressed Air Geared.)
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Ingersoll-Rand Co., New York.

HOISTS.
(Electric.)
Alliance Machine Co., Alliance, O.
Browning, Victor R., & Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS.
(Pneumatic.)
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

HOOPS AND BANDS.
Acme Steel Goods Co., Chicago, Ill.
American Steel & Wire Co., Chicago, Ill.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
McCance Bros. Co., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

HOSE.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.

INJECTORS.
Watson, N. A., Erie, Pa.

INSTRUMENTS.
(Electrical.)
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

IRON.
(Basic—Bessemer—Malleable.)
Inland Steel Co., Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.

IRON.
(Cutting Apparatus.)
Newton Mach. Tool Wks., Inc., Philadelphia.

IRON.
(Pig.)
Baird & West, Detroit, Mich.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Carnegie Steel Co., Pittsburgh, Pa.
Columbus Iron & Steel Co., Columbus, O.
Eaton, Rhodes & Co., Cincinnati, O.
Globe Iron Co., Jackson, O.
Hanna & Co., M. A., Cleveland, O.
Hillman & Son, J. H., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mitchell-Diggins Iron Co., Cadillac, Mich.
Mohr, J. J., & Son, Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Pioneer Coal & Coke Co., St. Louis, Mo.
Republic Iron & Steel Co., Youngstown, O.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Snyder & Co., W. P., Pittsburgh, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tenn. Coal, Iron & R. R. Co., Birm'ham, Ala.
Thomas Furnace Co., Milwaukee, Wis.
Upson Nut Co., Cleveland, O.
Walter-Wallingford & Co., Cincinnati, O.

IRON.
(Staybolt.)
Bourne-Fuller Co., Cleveland, O.

IRON AND STEEL.
(Galvanized.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
McCalla, Harold, Philadelphia, Pa.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Wood & Co., Alan, Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

IRON AND STEEL.
(Scrap.)
American Bridge Co. of New York, N. Y.

IRON AND STEEL.
(Swedish.)
Bourne-Fuller Co., Cleveland, O.
Scully Steel & Iron Co., Chicago, Ill.

JAPANNING.
(All Colors.)
Geuder, Paeschke & Frey Co., Milwaukee.

JOINTS.
(Rail.)
Carnegie Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

JOINTS.
(Universal.)
Boston Gear Works, Norfolk Downs, Mass.

KETTLES AND POTS.
(Galvanizing.)
Wilfong Iron Works Co., M. F., Philadelphia.

KEYS AND COTTERS.
(Machine.)
Standard Gauge Steel Co., Beaver Falls, Pa.

KEYSEATERS.
Baker Bros., Toledo, O.
Mitts & Merrill, Saginaw, Mich.

LADLES.
Elec. Locomotive & Car Co., West Park, O.
Northern Engineering Works, Detroit, Mich.
Riter-Conly Mfg. Co., Pittsburgh, Pa.
Whiting Fdy. & Equip. Co., Harvey, Ill.

LAMPS.
(Arc.)
Benjamin Electric Mfg. Co., Chicago, Ill.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

LAMPS.
(Incandescent.)
Benjamin Electric Mfg. Co., Chicago, Ill.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

LATH.
(Expanded Metal.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Brier Hill Steel Co., The, Youngstown, O.
Newport Rolling Mill Co., Newport, Ky.
Trussed Concrete Steel Co., Detroit, Mich.
Youngstown Iron & Steel Co., Youngstown.

LATHES.
Baird Machinery Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Fox Machine Co., Grand Rapids, Mich.
Jones & Lamson Mach. Co., Springfield, Vt.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Niles-Bement-Pond Co., New York City.

LATHES.
(Turret.)
Jones & Lamson Mach. Co., Springfield, Vt.
New Britain Mach. Co., New Britain, Ct.

LINE MATERIAL.
(Telegraph and Telephone.)
Inland Steel Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

LININGS.
(Brake.)
Erbestos Brake Lining Co., Philadelphia, Pa.

LININGS.
(Cupola.)
Big Savage Fire Brick Co., Frostburg, Md.
Louisville Fire Br'k Wks., Highland Park, Ky.

LININGS.
(Forge and Furnace.)
Ashland Fire Brick Co., Ashland, Ky.
Pyro Clay Products Co., Oak Hill, O.

LININGS.
(Ladle.)
Pyro Clay Products Co., Oak Hill, O.

LOCKERS.
(Wire-Sheet Metal.)
Bernstein Mfg. Co., Philadelphia, Pa.

LOCOMOTIVES.
(Electric.)
Atlas Car & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg

LOCOMOTIVES.
(Industrial.)
Vulcan Iron Works, Wilkesbarre, Pa.

LUMBER.
(Boxing, Crating, Flask and Pattern.)
Johnson Lumber Co., Milwaukee, Wis.

MACHINERY.
(Automatic Gear Cutting.)
Cincinnati Gear Cutting Mch. Co., Cincinnati.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Barb Wire Fence, Barb Nail Wire, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Bending and Straightening.)
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Covington Machine Co., Covington, Va.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Logemann Bros. Co., Milwaukee, Wis.
Long & Allstatter Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mchy. Co., Youngstown, O.

MACHINERY.
(Blue Printing.)
Buckeye Engine Co., Salem, O.

MACHINERY.
(Bolt and Nut.)
Baird Machinery Co., Pittsburgh, Pa.
Detrick & Harvey Mach. Co., Baltimore, Md.
Landis Machine Co., Waynesboro, Pa.
National Mchy. Co., Tiffin, O.
Newton Mch. Tool Wks., Inc., Philadelphia.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Boring and Turning.)
Baker Bros., Toledo, O.
Detrick & Harvey Mach. Co., Baltimore, Md.
Espen-Lucas Machine Wks., Philadelphia, Pa.
McCabe, J. J., New York City.
Mitts & Merrill, Saginaw, Mich.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY.
(By-Product Coke Oven.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Cement.)
Vulcan Iron Works, Wilkesbarre, Pa.

MACHINERY.
(Centrifugal.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Coil and Trace Chain, Welded Chain Factories.)
Turner Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Coke Ovens.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Coping.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Crushing.)
Bartlett & Snow Co., C. O., Cleveland, O.
Kirk Supply Co., Pittsburgh, Pa.

MACHINERY.
(Cutting Off—Cold Metal.)
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Newton Mch. Tool Wks., Inc., Philadelphia.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Drilling.)
Baker Bros., Toledo, O.
Baush Machine Tool Co., Springfield, Mass.
Fox Machine Co., Grand Rapids, Mich.
Hisey-Wolf Machine Co., Cincinnati, O.
Massillon Fdy. & Mch. Co., Massillon, O.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.

WHERE TO BUY

MACHINERY.
(Drilling and Boring, Horizontal.)
Detrick & Harvey Mach. Co., Baltimore, Md.
Newton Mch. Tool Wks., Inc., Philadelphia.
Pawling & Harnischfeger Co., Milwaukee.

MACHINERY.
(Drilling, Multiple.)
Baush Machine Tool Co., Springfield, Mass.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Drilling, Radial.)
Baush Machine Tool Co., Springfield, Mass.
Hisey-Wolf Machine Co., Cincinnati, O.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Electric Welding.)
Long & Allstatter Co., Hamilton, O.
Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welder Co., Cincinnati, O.
Winfield Elec. Welding Mach. Co., Warren, O.

MACHINERY.
(Elevating and Conveying.)
Bartlett & Snow Co., C. O., Cleveland, O.
Brown Hoisting Mchy. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Vulcan Iron Works, Wilkesbarre, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

MACHINERY.
(Forging.)
Bethlehem Steel Co., So. Bethlehem, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Galvanizing.)
Erie Foundry Co., Erie, Pa.

MACHINERY.
(Gear Cutting.)
Cincinnati Gear Cutting Mch. Co., Cincinnati.
Cincinnati Shaper Co., Cincinnati, O.
Gleason Works, Rochester, N. Y.
Newton Mch. Tool Wks. Inc., Philadelphia.

MACHINERY.
(Grinding.)
Blake & Johnson Co., Waterbury, Conn.
Landis Tool Co., Waynesboro, Pa.
Newton Mch. Tool Wks. Inc., Philadelphia.
Norton Co., Worcester, Mass.
Pittsburgh Emery Wheel Co., Pittsburgh, Pa.

MACHINERY.
(Hydraulic.)
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Milling.)
Cincinnati Milling Mch. Co., Cincinnati, O.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Foote Bros. Gear & Mch. Co., Chicago, Ill.
Fox Machine Co., Grand Rapids, Mich.
McCabe, J. J., New York City.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY.
(Mining.)
McMyler Interstate Co., Cleveland, O.
Prescott Steam Pump Wks., Milwaukee.
Thew Automatic Shovel Co., Lorain, O.

MACHINERY.
(Molding.)
Arcade Mfg. Co., Freeport, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Nut Facing.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Pipe Mill.)
Fox Machine Co., Grand Rapids, Mich.
Landis Machine Co., Waynesboro, Pa.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Planing.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Rolling Mill.)
Alliance Machine Co., Alliance, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blake & Johnson Co., Waterbury, Conn.
Carroll Foundry & Machine Co., Bucyrus, O.
Farrel Foundry & Mch. Co., Ansonia, Conn.
Fawcus Machine Co., Pittsburgh, Pa.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Johnston & Jennings Co., Cleveland, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Standard Engineering Co., Ellwood City, Pa.
Tod Co., Wm., Youngstown, O.
Union Fdy. & Mach. Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Fdy. & Mchy. Co., Youngstown, O.

MACHINERY.
(Screw, Automatic.)
Bickford Machine Co., Greenfield, Mass.
Cook Co., Asa S., Hartford, Conn.
Davenport Mch. Tool Co., New Bedford, Mass.

MACHINERY.
(Second Hand.)
Baird Machinery Co., Pittsburgh, Pa.
McCabe, J. J., New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.
Stewart Co., Paul, Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland.
Toomey, Frank, Philadelphia, Pa.

MACHINERY.
(Shearing.)
Bertsch & Co., Cambridge City, Ind.
Erie Foundry Co., Erie, Pa.

MACHINERY.
(Sheet Metal Working.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.

MACHINERY.
(Shovel.)
Bertsch & Co., Cambridge City, Ind.

MACHINERY.
(Spike and Nail.)
National Machinery Co, Tiffin, O.

MACHINERY.
(Tapping.)
Baker Bros., Toledo, O.

MACHINERY.
(Thread Rolling.)
Blake & Johnson Co., Waterbury, Conn.

MACHINERY.
(Tin House.)
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Wire Drawing, Wire and Rivet Works.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire.)
Blake & Johnson Co., Waterbury, Conn.

MACHINERY.
(Wire Galvanizing, Wire Tinning, Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire Nails and Staples, Wire Nail Mills.)
Kilby Mfg. Co., Cleveland, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wood Working.)
Fox Machine Co., Grand Rapids, Mich.

MACHINISTS.
(Special Machinery.)
Bethlehem Steel Co., So. Bethlehem, Pa.
Bilgram Machine Works, Philadelphia, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bliss Co., E. W., Brooklyn, N. Y.
Carroll Foundry & Machine Co., Bucyrus, O.
Davenport Mch. Tool Co., New Bedford, Mass.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Kilby Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.
Manning, Maxwell & Moore, Inc., New York.
McKinnon Iron Works Co., The, Ashtabula, O.
Merrill Bros., Maspeth, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
Toledo Machine & Tool Co., Toledo, O.

MAGNESITE.
American Refractories Co., Chicago, Ill.

MAGNESITE.
(Dead Burned.)
Stowe-Fuller Co., Cleveland, O.

MAGNETS.
(Lifting.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

METAL.
(Antimony, Copper.)
Blackwell, Geo. G., Sons & Co., Liverpool, Eng.

METAL.
(Babbitt.)
Riverside Metal Refining Co., Connellsville, Pa.

METAL.
(Expanded.)
Youngstown Iron & Steel Co., Youngstown, O.

METAL.
(Perforated.)
Hendrick Mfg. Co., Carbondale, Pa.

METAL.
(Washed.)
Brier Hill Steel Co., The, Youngstown, O.

MILLS.
(Billet.)
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

MILLS.
(Continuous Rolling.)
Morgan Construction Co., Worcester, Mass.

MILLS.
(Wire Complete Equipment.)
Blake & Johnson Co., Waterbury, Conn.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.

MILL AND MINE SUPPLIES.
Kirk Supply Co., Pittsburgh, Pa.

MIXERS.
(Concrete, Sand and Blending.)
Kirk Supply Co., Pittsburgh, Pa.

MODELS.
(Made to Order.)
Standard Pattern Works Co., Cleveland, O.

MOLDS.
(Ingot.)
Carnegie Steel Co., Pittsburgh, Pa.
Interstate Foundry Co., Cleveland, O.
Marshall Foundry Co., Pittsburgh, Pa.
Youngstown Fdy. & Mch. Co., Youngstown, O.

MOTORS.
(Air.)
Detroit Hoist & Machine Co., Detroit, Mich.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

MOTORS.
(Electric D. C. and A. C.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

MOTORS.
(Mill.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

NAILS.
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Johnstown, Pa.
Corbin Screw Corpn., New Britain, Conn.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NIPPLES.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
National Tube Co., Pittsburgh, Pa.

NUTS.
American Bridge Co. of New York, New York
American Iron & Steel Mfg. Co., Lebanon, Pa.
Atlas Bolt & Screw Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland.
Corbin Screw Corpn., New Britain, Conn.
Garland Nut & Rivet Co., Pittsburgh, Pa.
Gary Screw & Bolt Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.

NUTS.
(Hot Pressed.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Upson Nut Co., Cleveland, O.

ORE.
(Chrome.)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Samuel, Frank, Philadelphia, Pa.

ORE.
(Iron.)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Hanna, M. A., & Co., Cleveland, O.
Hillman & Son, J. H., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Snyder & Co., W. P., Pittsburgh, Pa.
Tod-Stambaugh Co., Cleveland, O.

WHERE TO BUY

OVENS.
Koppers Co., H., Chicago, Ill.

OVENS.
(By-Products Coke Ovens.)
Coal Distillation Co., New York, N. Y.
Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

OVENS.
(Coke.)
Coal Distillation Co., New York, N. Y.
Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

OVENS.
(Core.)
Rockwell Furnace Co., New York.

PAILS.
(Foundry.)
Geuder, Paeschke & Frey Co., Milwaukee, Wis.

PANS.
(Grinding.)
Phillips & McLaren Co., Pittsburgh, Pa.

PANS.
(Lathe.)
New Britain Machine Co., New Britain, Conn.

PATTERNS.
Arcade Mfg. Co., Freeport, Ill.
Standard Pattern Wks. Co., The, Cleveland, O.
Youngstown Fdy. & Mch. Co., Youngstown, O.

PERFORATING.
(Sheet Metal-Automatic, Screen Work.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

PILING.
(Steel Sheet Interlocking.)
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

PINIONS.
General Electric Co., Schenectady, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Nuttall, R. D., Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
Van Dorn & Dutton Co., Cleveland, O.

PINIONS.
(Mill, Cut)
Tod Co., Wm., Youngstown, O.

PINIONS.
(Rawhide.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R D., Co., Pittsburgh, Pa.

PINS.
(Knuckle and Brake.)
Champion Rivet Co., Cleveland, O.
Oliver Iron & Steel Co., Pittsburgh, Pa.

PINS.
(Pivot.)
Champion Rivet Co., Cleveland, O.

PIPE.
Bourne-Fuller Co., Cleveland, O.
Central Tube Co., Pittsburgh, Pa.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Iron & Steel Co., Massillon, O.
National Tube Co., Pittsburgh, Pa.
Pittsburgh Valve Fdy. & Const. Co., Pittsburg.
Shaw-Kendall Engrg. Co., Toledo, O.
Struthers-Wells Co., Warren, Pa.
U. S. Cast Iron Pipe & Fdy. Co., New York.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Drive, Iron and Steel.)
Republic Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Iron and Steel, Galvanized.)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Line, Iron and Steel.)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Riveted Steel.)
American Bridge Co. of New York, New York.
Cambria Steel Co., Johnstown, Pa.
Graver Tank Wks., Wm., East Chicago, Ind.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Struthers-Wells Co., Warren, Pa.

PIPE.
(Wrought Iron.)
Bourne-Fuller Co., Cleveland, O.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Youngstown Sheet & Tube Co., Youngstown, O.

PLANERS.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Planer Works, Cleveland, O.
Cleveland Punch & Shear Wks., Co., Cleveland.
Detrick & Harvey Mch. Co., Baltimore, Md.
Manning, Maxwell & Moore, Inc., New York.
Ryerson, Joseph T., & Son, Chicago, Ill.

PLANTS.
(By-Products Coke Ovens.)
Koppers Co., H., Chicago, Ill.

PLATE.
(Tin.)
American Sheet & Tin Plate Co., Pittsburgh.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Standard Tin Plate Co., Canonsburg, Pa.
Taylor, N. & G., Philadelphia, Pa.

PLATES.
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Newport Rolling Mill Co., Newport, Ky.
Otis Steel Co., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Taylor, N. & G., Co., Philadelphia, Pa.
Tenn. Coal, Iron & R. R. Co., Birm'gham, Ala.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Worth Bros. Co., Coatesville, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

PLATES.
(Boiler and Tank.)
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
La Belle Iron Wks., Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Otis Steel Co., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Worth Bros. Co., Coatesville, Pa.

PLATES.
(Felloe.)
Wrought Washer Mfg. Co., Milwaukee, Wis.

PLATES.
(Floor.)
Carnegie Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.

PLATES.
(Sheared.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Illinois Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.

PLATES.
(Tie.)
Illinois Steel Co., Chicago, Ill.
Lackawanna Steel Co., Buffalo, N. Y.

PLATES.
(Universal.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Wks., Steubenville, O.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

PLUMBAGO.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Ilsley, Doubleday & Co., New York City.

POINTERS.
(Wire Rod, Wire Mills.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

PRESSES.
Birdsboro Steel Fdy. & Mch. Co.,
Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson & Son, Jos. T, Chicago, Ill.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mach. Co.,
Waterbury, Conn.
Wood, R. D., Co., Philadelphia, Pa.

PRESSES.
(Baling.)
Logemann Bros. Co., Milwaukee, Wis.

PRESSES.
(Bending and Flanging)
Mesta Machine Co., Pittsburgh, Pa.

PRESSES.
(Forging.)
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PRESSES.
(Hydraulic.)
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Bros. Co., Milwaukee, Wis.
Mesta Machine Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PRESSES.
(Metal Scrap Bundling.)
Logemann Bros. Co., Milwaukee, Wis.

PRESSES.
(Power.)
Toledo Machine & Tool Co., Toledo, O.

PRESSES.
(Rail Straightening.)
Tod Co., Wm., Youngstown, O.

PRESSES.
(Steam, Sleeves, Runner Brick, Nozzles and Tuyeres. Fire Brick Works.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

PRESSES.
(Toggle Drawing.)
Toledo Machine & Tool Co., Toledo, O.

PRESSES.
(Trimming.)
Massillon Fdy. & Mach. Co., Massillon, O.
Toledo Machine & Tool Co., Toledo, O.

PRODUCERS.
(Gas.)
Cooper, C. & G., Co., Mt. Vernon, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Hagan, Geo. J., Pittsburgh, Pa.
Koppers Co., H., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Struthers-Wells Co., Warren, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

PULLEYS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

PUMPS.
Aldrich Pump Dept., Allentown, Pa.
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
Lake Erie Engrg. Works, Buffalo, N. Y.
Prescott Steam Pump Co., Milwaukee, Wis.
Tod Co., Wm., Youngstown, O.

PUMPS.
(Bank.)
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Boiler Feed.)
Aldrich Pump Department, Allentown, Pa.
Cameron, A. S., Steam Pump Wks., New York
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Prescott Steam Pump Co., Milwaukee, Wis.
Virginia Fdry. & Mach. Co., Virginia, Minn.

PUMPS.
(Compound.)
Cameron, A. S., Steam Pump Wks., New York
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Deep Well.)
Cameron, A. S., Steam Pump Wks., New York
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.

PUMPS.
(Electric Driven.)
Aldrich Pump Dept., Allentown, Pa.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.

PUMPS.
(Elevator.)
Aldrich Pump Department, Allentown, Pa.
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Hydraulic.)
Aldrich Pump Department, Allentown, Pa.
Cameron, A. S., Steam Pump Wks., New York
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Bros. Co., Milwaukee, Wis.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Mine.)
Aldrich Pump Department, Allentown, Pa.
Cameron, A. S., Steam Pump Wks., New York
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Steam.)
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Vacuum.)
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.

PUNCHES AND SHEARS.
Allen, John F., Co., New York City.
Alliance Machine Co., Alliance, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland
Covington Mch. Co., Covington, Va.
Long & Allstatter Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Bridge Tool Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

WHERE TO BUY

PUNCHES.
(Hand.)
Bertsch & Co., Cambridge City, Ind.
Bourne-Fuller Co., Cleveland, O.

PUNCHES.
(Hydraulic.)
Bertsch & Co., Cambridge City, Ind.
Mesta Machine Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.

PUNCHES.
(Multiple.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.

PUNCHES.
(Pneumatic.)
Allen, John F., Co., New York City.

PYROMETERS.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Stupakoff Laboratories, Pittsburgh, Pa.
Thwing Instrument Co., Philadelphia, Pa.

RACKS.
(Steel or Tool.)
New Britain Mach. Co., New Britain, Conn.

RAILS.
Bourne-Fuller Co., Cleveland, O.
Buckeye Rolling Mill Co., Steubenville, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Foster Co., L. B., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
National Iron & Steel Co., Houston, Tex.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.

RAMMERS.
(Foundry.)
Ingersoll-Rand Co., New York.

REAMERS.
Morse Twist Drill & Mach. Co.,
New Bedford, Mass.

RECEIVERS.
(Air.)
Graver Tank Works, Wm., E. Chicago, Ind.
Ingersoll-Rand Co., New York.

REELS.
(Wood and Iron, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

REGENERATORS.
Coal Distillation Co., New York, N. Y.

REGULATORS.
(Boiler Feed Water, Open Feed Water Heater and Pressure.)
Strong, Carlisle & Hammond Co., Cleveland.

REGULATORS.
(Speed.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

RESEATERS.
(Valve.)
McKinnon Iron Works Co., The, Ashtabula, O.

RIVETERS.
(Hydraulic.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Wood & Co., R. D., Philadelphia, Pa.

RIVETERS.
(Pneumatic.)
Allen, John F., Co., New York City.
Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.
Ryerson, Jos. T., & Son, Chicago, Ill.

RIVETS.
(Structural, Boiler, Ship.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Carlin, Anthony, Cleveland, O.
Champion Rivet Co., Cleveland, O.
Clark Bros. Bolt Co., Milldale, Conn.
Garland Nut & Rivet Co., Pittsburgh, Pa.
Gary Screw & Bolt Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.

RODS.
(Drill, Polished.)
Bourne-Fuller Co., Cleveland, O.
Pittsburgh Shaft'g Co. of Detroit, Detroit, Mich.

RODS.
(Iron and Steel.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS.
(Straightened and Cut.)
Youngstown Sheet & Tube Co., Youngstown, O.

RODS.
(Wire.)
American Steel & Wire Co., Chicago, Ill.

ROLLS.
(Bending and Straightening.)
Bertsch & Co., Cambridge City, Ind.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ROLLS.
(Sand Chilled and Steel.)
American Steel Foundries, Chicago, Ill.
Birdsboro Steel Fdy. & Mch. Co.,
Birdsboro, Pa.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Garrison Fdy. Co., A., Pittsburgh, Pa.
Hubbard Steel Fdy. Co., East Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Seaman, Sleeth Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROOFING.
Hydrex Felt & Engineering Co., New York.

ROOFING.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
Amer. Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING.
(Iron and Steel.)
American Bridge Co. of New York, New York.
American Rolling Mill Co., Middletown, O.
Amer. Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE.
(Wire.)
American Steel & Wire Co., Chicago, Ill.

SAND.
(Molding.)
Garden City Sand Co., Chicago, Ill.
Ohio Sand Co., Conneaut, O.

SAND BLAST.
(Chilled Shot for use in)
Globe Steel Co., Mansfield, O.

SAND BLAST EQUIPMENT.
Paxson Co., J. W., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.

SASH.
(Window-Steel.)
Trussed Concrete Steel Co., Detroit, Mich.

SATURATORS.
(Ammonia.)
Koppers Co., H., Chicago, Ill.

SAWS.
(Band.)
Fox Machine Co., Grand Rapids, Mich.

SAWS.
(Cold Metal.)
Disston, Henry & Sons, Inc., Philadelphia, Pa.
Espen-Lucas Mach. Wks, Philadelphia, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Newton Mch. Tool Wks. Inc., Philadelphia.
Starrett, L. S., Co., Athol, Mass.

SAWS.
(Hack.)
Atkins, E. C., & Co., Inc., Indianapolis, Ind.

SAWS.
(Hot.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SCREENS.
Hendrick Mfg. Co., Carbondale, Pa.

SCREWS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Atlas Bolt & Screw Co, Cleveland, O.
Bridgeport Screw Co., Bridgeport, Conn.
Corbin Screw Corpn., New Britain, Conn.
Gary Screw & Bolt Co., Chicago, Ill.
Milton Mfg. Co., Milton, Pa.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

SCREWS.
(Set.)
Clark Bros. Bolt Co., Milldale, Conn.
Corbin Screw Corpn., New Britain, Conn.

SEPARATORS.
(Centrifugal Oil.)
American Tool & Machine Co., Boston, Mass.
National Separator & Mch. Co., Boston, Mass.

SEPARATORS.
(Magnetic.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.

SEPARATORS.
(Steam or Oil.)
Pittsburgh Valve, Fdy. & Cons. Co., Pittsburg
Strong, Carlisle & Hammond Co., Cleveland.

SHAFTING.
American Steel & Wire Co., Chicago, Ill.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Cumberland Steel Co., Cumberland, Md.
Gem Mfg. Co., Pittsburgh, Pa. (Flexible.)
Jones & Laughlin Steel Co. Pittsburgh, Pa.
Pittsburgh Shaft'g Co. of Detroit, Detroit, Mich.
Republic Iron & Steel Co., Youngstown, O.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.

SHAFTING.
(Cold Drawn or Rolled.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SHAFTING.
(Turned.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh.
Pittsburgh Shafting Co. of Detroit,
Detroit, Mich.

SHAPERS.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.

SHAPES.
(Agricultural.)
Carnegie Steel Co., Pittsburgh, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Republic Iron & Steel Co., Youngstown, O.

SHAPES.
(Steel, Structural and Special Rolled.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Pittsburgh Shaft'g Co. of Detroit, Detroit, Mich.
Scully Steel & Iron Co., Chicago, Ill.

SHEARS.
(Angle and Plate.)
Bertsch & Co., Cambridge City, Ind.
Mesta Machine Co., Pittsburgh, Pa.

SHEARS.
(Billet, Bloom and Slab.)
Garrison, A., Foundry Co., Pittsburgh, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Flying and Bar.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

SHEARS.
(Lever.)
Bertsch & Co., Cambridge City, Ind.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Power.)
Toledo Machine & Tool Co., Toledo, O.

SHEARS.
(Scrap, Alligator, Wire and Wire Nail Mills.)
Covington Machine Co., Covington, Va.
Mesta Machine Co., Pittsburgh, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

SHEARS.
(Squaring.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Vertical.)
Bertsch & Co., Cambridge City, Ind.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

WHERE TO BUY

SHEETS.
(Black Steel.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Blue Annealed.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Dead Soft for Stamping.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Phillips Sh't & Tin Plate Co., Weirton, W. Va.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Deep Drawing Stock.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Inland Steel Co., Chicago, Ill.
Massillon Rolling Mill Co., Massillon, O.
Phillips Sh't & Tin Plate Co., Weirton, W. Va.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Galvanized.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Iron and Steel.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Disston & Sons, Inc., Henry, Philadelphia.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Tennessee Coal, Iron & R. R. Co., Pittsburgh.
Wood, Alan, Iron & Steel Co., Philadelphia.
Worth Bros. Co., Coatesville, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Open-Hearth.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Pickled and Cold Rolled.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Polished.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Newport Rolling Mill Co., Newport, Ky.

SHEETS.
(Steel Box Annealed.)
American Sheet & Tin Plate Co., Pittsburgh.
Brier Hill Steel Co., The, Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Portsmouth Steel Co., Portsmouth, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHELVING.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

SHOVELS.
(Steam.)
Bucyrus Co., South Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.

SIFTERS.
(Sand.)
Arcade Mfg. Co., Freeport, Ill.
Whiting Fdy. Equipment Co., Harvey, Ill.

SLABS.
Andrews Steel Co., Newport, Ky.
Cambria Steel Co., Johnstown, Pa.
La Belle Iron Works, Steubenville, O.
Portsmouth Steel Co., Portsmouth, O.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SLABS.
(Sheet.)
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Bm'gh'm, Ala.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SPECIALTIES.
(Steam.)
Cameron, A. S., Steam Pump Wks., New York.
National Tube Co., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

SPIEGELEISEN.
Pickands, Brown & Co., Chicago, Ill.

SPIKES.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel & Wire Co., Chicago, Ill.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
McCance Bros. Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SPIKES.
(Screw.)
Illinois Steel Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.

SPLICES.
(Rail.)
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Republic Iron & Steel Co., Youngstown, O.

SPRINGS.
American Steel & Wire Co., Chicago, Ill.
Dunbar Bros. Co., Bristol, Conn.

SPRINGS.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

SPRINKLER SYSTEMS.
(Fire-Automatic.)
General Fire Extinguisher Co., Providence, R. I.

STACKS.
American Bridge Co. of New York, N. Y.
Des Moines Bridge & Iron Co.,
Des Moines, Ia., and Pittsburgh, Pa.
Freeman, S., & Sons, Mfg. Co., Racine, Wis.
Graver Tank Works, Wm., E. Chicago, Ind.
Struthers-Wells Co., Warren, Pa.
Western Drop Forge Co., Marion, Ind.

STAMPING.
Acklin Stamping Co., Toledo, O.

STAMPING.
(Sheet Metal.)
Acklin Stamping Co., Toledo, O.
Bettcher Mfg. Co., Cleveland, O.
Geuder, Paeschke & Frey Co., Milwaukee.
Sterling Mch. & Stamping Co., Wellington, O.

STARTERS.
(Electric Motor.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh.

STEEL.
American Bridge Co. of New York, N. Y.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Disston & Sons, Inc., Henry, Philadelphia.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Laclede Steel Co., St. Louis, Mo.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Pittsburgh Shafting Co. of Detroit,
Detroit, Mich.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Tennessee Coal, Iron & R. R. Co., Bm'gh'm, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown, O.

STEEL.
(Axle.)
(Automobile Mining Car.)
Columbia Steel & Shafting Co., Pittsburgh.
Union Drawn Steel Co., Beaver Falls, Pa.

STEEL.
(Cold Rolled.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh.
Newport Rolling Mill Co., Newport, Ky.
Pittsburgh Shafting Co. of Detroit,
Detroit, Mich.
Scully Steel & Iron Co., Chicago, Ill.

STEEL.
(Cold Drawn.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh.
Pittsburgh Shafting Co. of Detroit,
Detroit, Mich.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.

STEEL.
(Electric.)
Illinois Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.

STEEL.
(High Speed.)
Allen, Edgar, & Co., Ltd., New York, N. Y.
Baldwin Steel Co., New York, N. Y.
Bethlehem Steel Co., South Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL.
(Open-Hearth.)
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., The, Youngstown, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Portsmouth Steel Co., Portsmouth, O.
Union Drawn Steel Co., Beaver Falls, Pa.
Upson Nut Co., Cleveland, O.

STEEL.
(Screw Stock.)
Columbia Steel & Shafting Co., Pittsburgh.

STEEL.
(Structural.)
American Bridge Co. of New York, N. Y.
Bethlehem Steel Co., South Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Eichleay, John Jr., Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago
Illinois Steel Warehouse Co., St. Louis, Mo.
Independent Bridge Co., Pittsburgh, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Bridge Co., Buffalo, N. Y.
Lackawanna Steel Co., Buffalo, N. Y.
McClintic-Marshall Const. Co., Pittsburgh, Pa.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Worden-Allen Co., Chicago, Ill.

STEEL.
(Tool.)
Allen, Edgar & Co., Ltd., New York City.
Baldwin Steel Co., New York, N. Y.
Bethlehem Steel Co., South Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Disston & Sons, Inc., Henry, Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

WHERE TO BUY

STEEL.
(Twisted.)
Bourne-Fuller Co., Cleveland, O.
Upson Nut Co., Cleveland, O.

STEEL.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
United Steel Co., Canton, O.
Vanadium Alloys Steel Co., Latrobe, Pa.

STILLS.
(Ammonia.)
Koppers Co., H., Chicago, Ill.

STOKERS.
Erie Foundry Co., Erie, Pa.
Green Engrg. Co., Chicago, Ill.
Rosedale Fdy. & Mch. Co., Pittsburgh, Pa.

STONES.
(Oil.)
Norton Co., Worcester, Mass.

STONES.
(Rubbing and Sharpening.)
Norton Co., Worcester, Mass.

STORAGE MACHINERY.
(Coal.)
Jeffrey Mfg. Co., Columbus, O.

STUDDING.
(Metal.)
Youngstown Iron & Steel Co., Youngstown, O.

SWITCHES.
(Electrical.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh.

SWITCHES.
(Magnetic.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh.

SWITCHES.
(Solenoid.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

TABLES.
(Drawing.)
Economy Drawing Table Co., Toledo, O.

TABLES.
(Rolling Mill.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh.

TANKS AND TOWERS.
American Annealing Box Co., Canton, O.
American Welding Co., Carbondale, Pa.
Des Moines Bridge & Iron Co.,
Des Moines, Ia., and Pittsburgh, Pa.
Freeman, S., & Sons Mfg. Co., Racine, Wis.
Graver Tank Works, Wm., East Chicago, Ind.
National Tube Co., Pittsburgh, Pa.
Pennsylvania Boiler Works, Erie, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Struthers-Wells Co., Warren, Pa.
Western Drop Forge Co., Marion, Ind.

TANKS.
(Water and Acid Storage, Wire Mills.)
Struthers-Wells Co., Warren, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TAR EXTRACTORS.
Koppers Co., H., Chicago, Ill.

TEETH.
(Steel Harrow.)
Inland Steel Co., Chicago, Ill.

THERMOMETERS.
Brown Instrument Co., Philadelphia, Pa.

TILE.
(Fire Clay, Furnace, Etc.)
Ashland Fire Brick Co., Ashland, Ky.
Union Mining Co., Mt. Savage, Md.

TINNING.
(Custom Work.)
Geuder, Paeschke & Frey Co., Milwaukee.

TOOLS.
(Machinists'.)
Morse Twist Drill & Mach. Co.,
New Bedford, Mass.

TOOLS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.
Ryerson, Joseph T., & Sons, Chicago, Ill.

TOOLS.
(Thread Cutting.)
Landis Machine Co., Waynesboro, Pa.

TRACK.
(Industrial.)
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Elec. Locomotive & Car Co., West Park, O.

TRAMRAILS.
(Overhead Systems.)
Brown Hoisting Machinery Co., Cleveland, O.
Northern Engrg. Works, Detroit, Mich.
Philadelphia Tramrail Co., Philadelphia, Pa.
Whiting Foundry Equip. Co., Harvey, Ill.

TRANSMISSION EQUIPMENT.
(Power.)
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., Pittsburgh.

TRAPS.
(Steam.)
McAuley Automatic Trap Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

TROLLEYS.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O
Shepard Electric Crane & Hoist Co.,
Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS.
(Foundry.)
Sterling Wheelbarrow Co., West Allis, Wis.

TRUCKS.
(Motor.)
Kissel Motor Car Co., Hartford, Wis.

TRUCKS.
(Wire, Rod, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUBES.
Andrews Steel Co., Newport, Ky.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBES.
(Boiler.)
Allegheny Steel Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
National Tube Co., Pittsburgh, Pa.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Worth Bros. Co., Coatesville, Pa.

TUBING.
(Automobile.)
National Tube Co., Pittsburgh, Pa.

TUBING.
(Oil Well.)
National Tube Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBING.
(Seamless Steel.)
National Tube Co., Pittsburgh, Pa.
Pittsburgh Shafting Co. of Detroit,
Detroit, Mich.

TUMBLING MILLS.
Northern Engrg. Works, Detroit, Mich.
Sly Mfg. Co., W. W., Cleveland, O.
Whiting Foundry Equip. Co., Harvey, Ill.

TURBINES.
(Steam.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

TURNBUCKLES.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

TURNTABLES.
Atlas Car & Mfg. Co., Cleveland, O.
Chase Fdy. & Mfg. Co., Columbus, O.

UNIONS.
(Pipe.)
Dart, E. M., Mfg. Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
(Nokoros.)
National Tube Co., Pittsburgh, Pa.

VALVES.
American Steam Gauge & Valve Mfg. Co.,
Boston, Mass.
Homestead Valve Mfg. Co., Pittsburgh, Pa.
Locke Regulator Co., Salem, Mass.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Pittsburgh Valve, Fdy. & Cons. Co., Pittsburgh.
Shaw-Kendall Engrg. Co., Toledo, O.
Strong, Carlisle & Hammond Co., Cleveland.

VALVES, AND FITTINGS.
(Hydraulic.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.

VALVES.
(Reducing.)
Strong, Carlisle & Hammond Co., Cleveland.

VANADIUM.
American Vanadum Co., Pittsburgh, Pa.

VENTILATORS.
Eichleay, John Jr., Co., Pittsburgh, Pa.

VISES.
Merrill Bros., Maspeth, N. Y.

WAGON HARDWARE.
Oliver Iron & Steel Co., Pittsburgh, Pa.

WASHERS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bettcher Mfg. Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Clark Bros. Bolt Co., Milldale, Conn.
Corbin Screw Corpn., New Britain, Conn.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
Milton Mfg. Co., Milton, Pa.
Newport Rolling Mill Co., Newport, Ky.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Upson Nut Co., Cleveland, O.
Wrought Washer Mfg. Co., Milwaukee, Wis.

WATER SOFTENERS AND PURIFIERS.
Graver Tank Works, Wm., E. Chicago, Ind.

WELDERS.
(Electric.)
Long & Allstatter Co., Hamilton, O.
Thomson Elec. Welding Co., Lynn, Mass.
Toledo Electric Welder Co., Cincinnati, O.
Winfield Elec. Welding Mach. Co., Warren, O.

WELDING.
(Custom.)
International Oxygen Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Thomson Electric Welding Co., Lynn, Mass.
Western Drop Forge Co., Marion, Ind.
Winfield Elec. Welding Mach. Co., Warren, O.

WELDING.
(Oxy-Acetylene Process.)
International Oxygen Co., New York City.
Oxweld Acetylene Co., Chicago, Ill.

WHEELBARROWS.
Sterling Wheelbarrow Co., West Allis, Wis.

WHEELS.
(Alundum.)
Norton Co., Worcester, Mass.

WHEELS.
(Emery.)
Pittsburgh Emery Wheel Co., Pittsburgh, Pa.

WHEELS.
(Grinding.)
Norton Co., Worcester, Mass.
Pittsburgh Emery Wheel Co., Pittsburgh.

WHEELS.
(Steel Car.)
American Steel Foundries, Chicago, Ill.
Carnegie Steel Co., Pittsburgh, Pa.

WIRE.
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Johnstown, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE.
(Barbed.)
American Steel & Wire Co., Chicago, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE.
(Cable and Rope.)
American Steel & Wire Co., Chicago, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE.
(Grilles.)
American Steel & Wire Co., Chicago, Ill.

WIRE.
(Threaded.)
Atlas Bolt & Screw Co., Cleveland, O.
Progressive Mfg. Co., Torrington, Conn.

WIRE.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

WIRE MILLS.
(Complete Equipment.)
Turner, Vaughn&Taylor Co., Cuyahoga Falls, O.

WRENCHES.
Gealy Wrench & Mfg. Co., Grove City, Pa.
Ryerson & Son, Jos. T., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.

These are a few of the tests by which our Open-Hearth Steel Castings stand unrivaled---

Best Quality Castings at common quality prices

Scullin-Gallagher Iron & Steel Co.
St. Louis, Mo.

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Tests from our physical testing Laboratory Reports, Nos. X-760, X-765 and X-783.

An average of six heats tested by Robt. W. Hunt & Company for the B., R. & P. Ry., and were witnessed by Mr. C. W. Herzog, representing Hunt & Company, on October 16th, 17th and 18th, 1912.

Elastic Limit Per Square Inch	38,200 Lbs.
Ultimate Strength "	69,100 "
Percent of Elongation	35.8
Percent of Reduction of Area	62.8

CHEMICAL ANALYSIS

Carbon	.210%	Sulphur	.019%
Phosphorus	.022%	Manganese	.740%
		Silicon	.340%

Average for two consecutive heats tested for the Northern Pacific Railroad Company, July 17th, 1912. Lab. No. X-693.

Elastic Limit Per Square Inch	36,450 Lbs.
Ultimate Strength "	73,500 "
Percent of Elongation	32.3
Percent of Reduction of Area	61.5

CHEMICAL ANALYSIS

Carbon	.170%
Phosphorus	.024%
Sulphur	.025%
Manganese	.730%
Silicon	.350%

Tests witnessed by Mr. J. G. Brown, Inspector for Mojeske & Angier, Chicago.

Average for three consecutive heats tested for the Wabash Railroad Company, August 1st, 1912. Lab. No. X-706.

Elastic Limit Per Square Inch	35,500 Lbs.
Ultimate Strength "	71,000 "
Percent of Elongation	30.0
Percent of Reduction of Area	61.5

CHEMICAL ANALYSIS

Carbon	.160%
Phosphorus	.022%
Sulphur	.024%
Manganese	.740%
Silicon	.340%

Tests witnessed by Mr. C. M. Vogel, representing Robt. W. Hunt & Co.

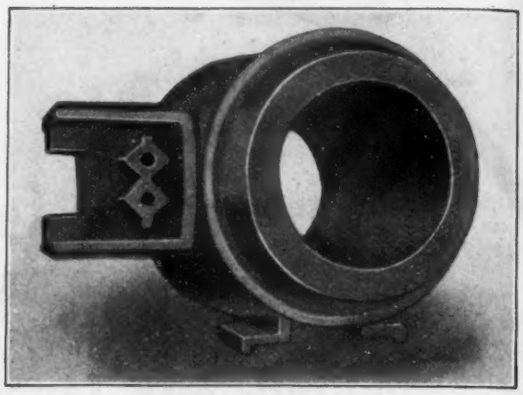
IN

CASTINGS

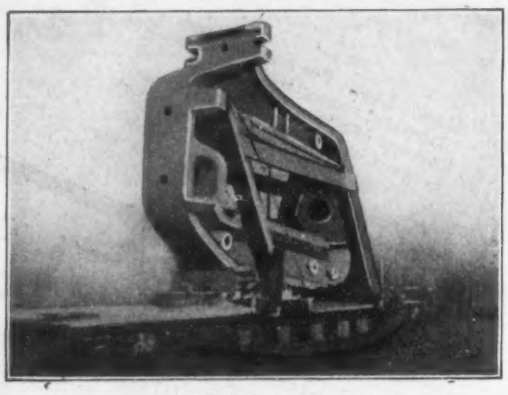
There is nothing too large for us to make

STEEL CASTINGS

from 100 to 100,000 pounds



29,000 Pounds



96,000 Pounds

OTIS STEEL

Otis Fire-Box Plates a Specialty. Flange Plates, Ship Plates, Tank Plates, Steel Axles of all kinds

Steel Castings and Forgings

The Otis Steel Company

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Better Castings
Better Deliveries

Chicago Steel Foundry Company

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The Taylor & Boggis Foundry Co.

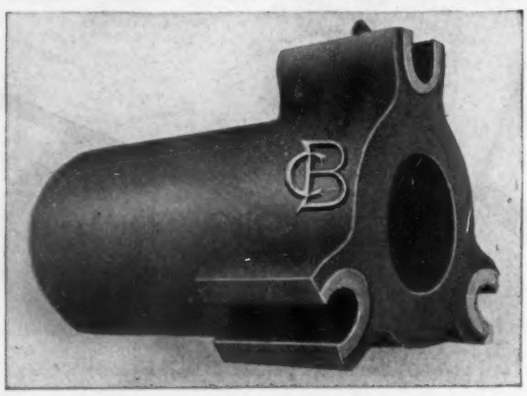
Fine Grey Iron Castings

OF EVERY DESCRIPTION

Including Stove Plate, Machinery, Rammed and Rapped by Compressed Air, Sand Blasted, Japanned, Nickel, Brass and Copper Plated

ALSO BUILDERS' HARDWARE

Cleveland, Ohio



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Basic Open Hearth Steel and Gray Iron **CASTINGS**

We build anything that can be made from Iron and Steel.

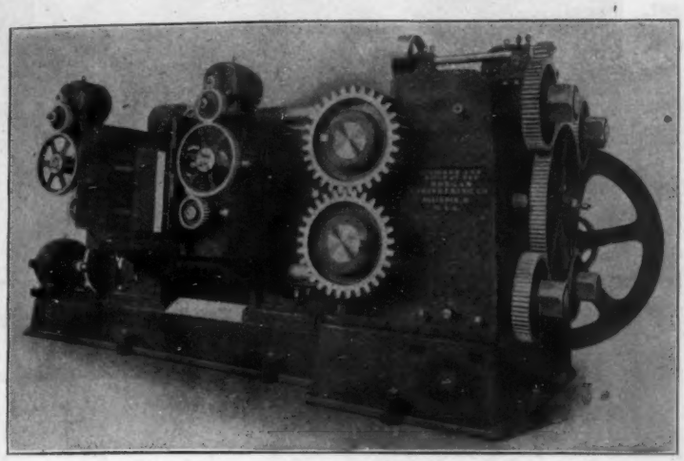
Special Machinery---Cut Gears

Everything High Grade — Can We Serve You?

The Carroll Foundry & Machine Co.

BUCYRUS, OHIO

Beam Straightener



ELECTRIC 5-MOTOR, BEAM STRAIGHTENER

For straightening 30" girders, 14" columns, the heaviest sections manufactured.

Straightening motion operated by 115 horse power, compound wound motor.

Maximum distance between anvils 11' 0".

Built for the Grey Structural Mill of The Bethlehem Steel Co., at their Saucon Plant, S. Bethlehem, Pa.

We have built similar presses for Milliken Bros. Co., New York; Lackawanna Steel Co., Buffalo, N. Y.; Praeger Eisenindustrie Gesellschaft, Austria; Austrian Alpine Mining Co., Vienna, Austria; Carnegie Steel Co., Homestead Works, Munhall, Pa.

Castings Grey Iron 1 lb. to 100 tons---Air Furnace--Semi-Steel--Brass--Special Bronze---Bearings and Bushings of all kinds --- Acid Resisting --- Bronze Chain (for Pickling Purposes)

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Pioneer Crane Builders. 3,500 Cranes in successful operation

Builders of Hammers, Shears and all kinds of heavy special machinery.

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For Machine Shops, Foundries, Railway Repair Shops, Shipyards, Lumber and Stone Yards

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YOU WILL SEARCH IN VAIN FOR A BETTER CRANE

NORTHERN CRANES

The cut shows a special 5 ton 125 ft. span crane for quick service. We are glad to figure on your special as well as your standard requirements. You ought to post yourself about Northern Cranes. They have interesting exclusive features. 1 to 150 Tons any span.

ELECTRIC CRANES HAND CRANES ELECTRIC HOISTS

Overhead Mono-Rail Hoist and Coal Storage Crane Systems

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Modern and Practical in Design, built by experienced mechanics. They stand the test.

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TOLEDO, OHIO

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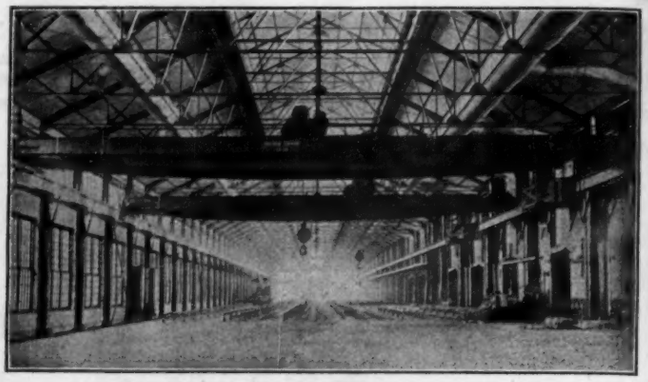
Cincinnati Cleveland Pittsburgh San Francisco Birmingham



Two 15 Ton Heavy Service Cranes in plant of Buckeye Steel Casting Co., Columbus, Ohio

Operates on any Crane Hook

For handling sand and other loose material, cleaning up foundry floors, filling flasks, digging pits, etc., a

WATTERS
QUICK DETACHABLE GRAB BUCKET

is unequaled. Especially adapted to steel foundry work as it can be attached and detached from the hook of an ordinary electric crane in a few seconds.

Pays for itself in a short time by the large saving in labor; will displace a score of foundry laborers. Designed so as to work in low headroom and without shock to the crane; can be controlled from crane cage or from the floor.

For further information and prices, write us.
Catalog free on request.

Complete Foundry Plants.

Cranes of all kinds for every service.

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
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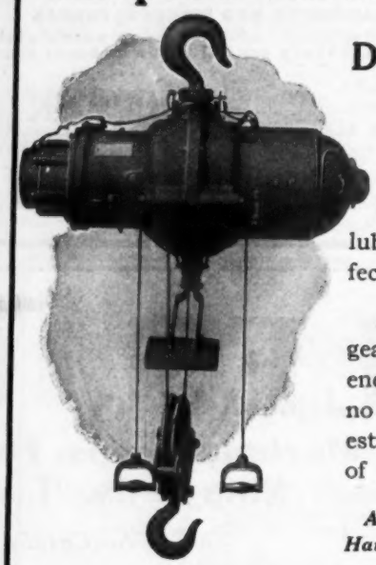
ALWAYS ON THE JOB

IS THE

Shepard Electric Hoist



Durable
Dependable
Efficient

Gears perfectly lubricated and perfectly aligned.

All wearing parts, gears and brakes fully enclosed---this means no repairs and smallest possible expense of upkeep.

Ask for Electric Hoist Hand Book.

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$350 Buys This 3 Ton Electric Hoist

with plain I beam trolley

Lift 18 feet.
Hoist Speed 12 feet per minute

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Electric Cranes—Standard
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43-inch Cutler-Hammer Lifting Magnet at plant of Pacific Coast Iron & Steel Wire Co., San Francisco

300 Tons Per Day

The 43-inch Cutler-Hammer magnet shown in the above illustration averages 300 Tons per ten-hour day, handling all sorts of miscellaneous shapes and sizes of scrap.

In some cases the lifts are trolleyed considerable distances by the crane, but notwithstanding this the average of 300 tons has been easily maintained by this

CUTLER-HAMMER 43-INCH LIFTING MAGNET

Doesn't a magnet like this interest you—one that can be depended upon every day to handle large quantities of material, that works without a minute's trouble or delay? Actual service has proven these facts—for over three years not a single ground or short-circuit has developed in a Cutler-Hammer lifting magnet.

C-H magnets are made in sizes and types for all classes of work. Let us know what materials you wish to handle and we will give you information based on experience.

Our Bulletin 12,000 contains reports of records and other magnet data and illustrations. Copy sent promptly on request.

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NEW YORK: Hudson Terminal, 50 Church St.
CHICAGO: Peoples Gas Bldg.
CLEVELAND: Schofield Bldg.
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PITTSBURG: Farmers' Bank Bldg.

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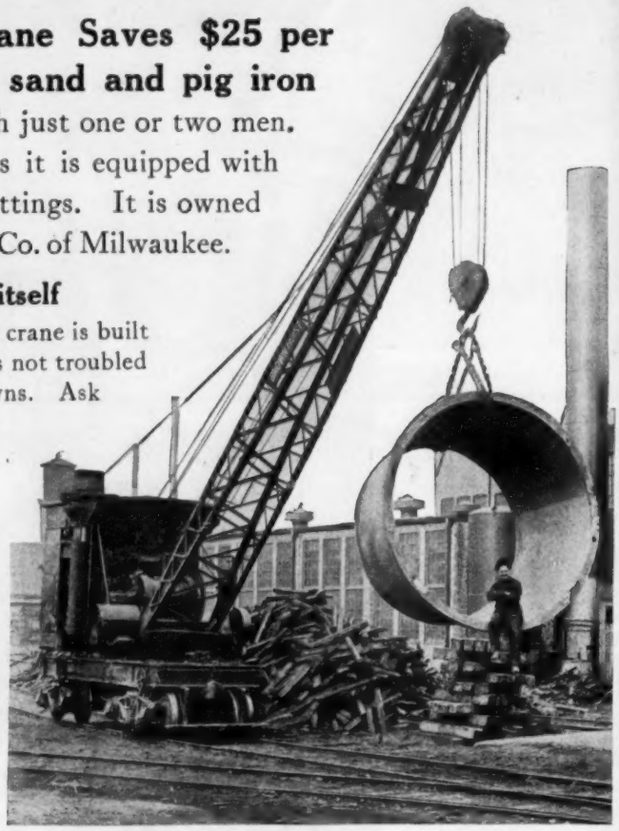
This Brownhoist Locomotive Crane Saves $25 per day in handling castings, flasks, sand and pig iron because it does the work rapidly and with just one or two men. And it is also used for shifting of cars as it is equipped with steam brake and M. C. B. standard car fittings. It is owned and operated by The Prime Steel Casting Co. of Milwaukee.

Such a machine soon pays for itself if it is a Brownhoist locomotive crane, because this crane is built for a hard and continuous service and the owner is not troubled with expensive delays and repairs due to breakdowns. Ask the man who has one.

The crane is made in different capacities —four or eight wheel—steam, electric or gas engine drive—and can be worked with bottom-block, grab-bucket or lifting magnet.

Send for Catalog I which shows how and where this crane is being used



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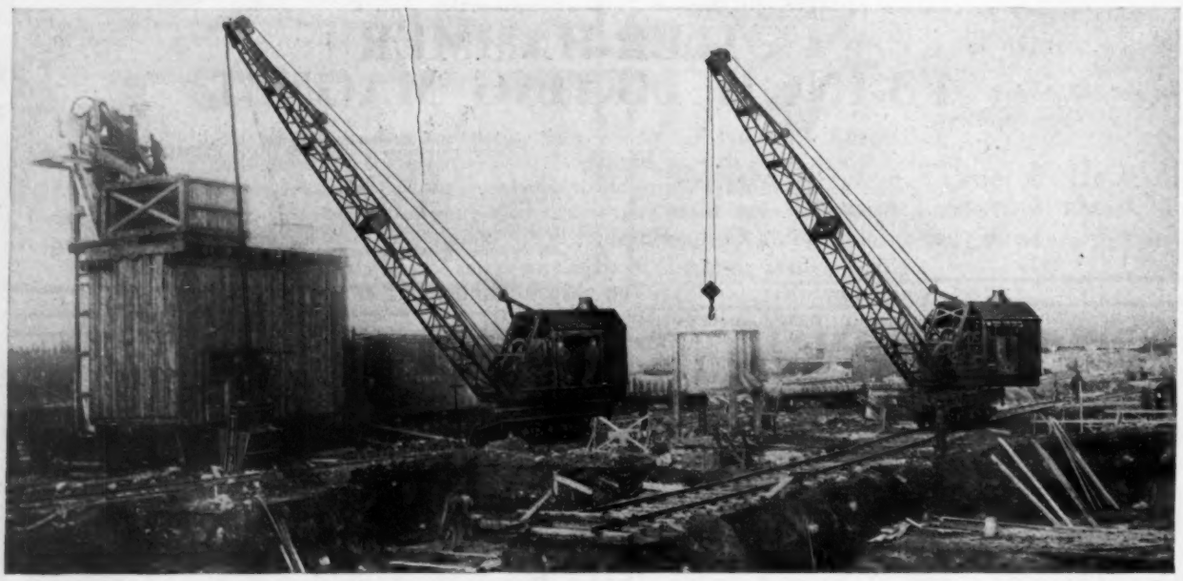
New York Los Angeles Cleveland Chicago



The present-day method of progress photographs will show the best equipment in use on construction work. The equipment is the index of the progress that this will show.

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Compressed Air Appliances

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1 to 15 Tons

Pneumatic Motors
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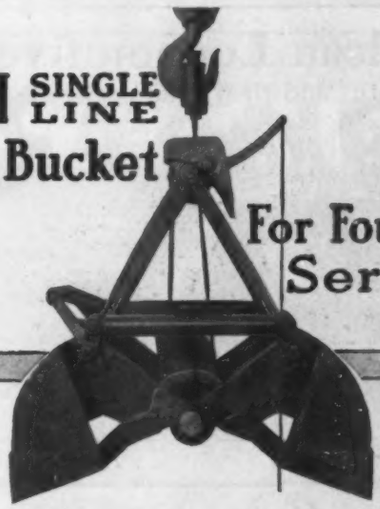

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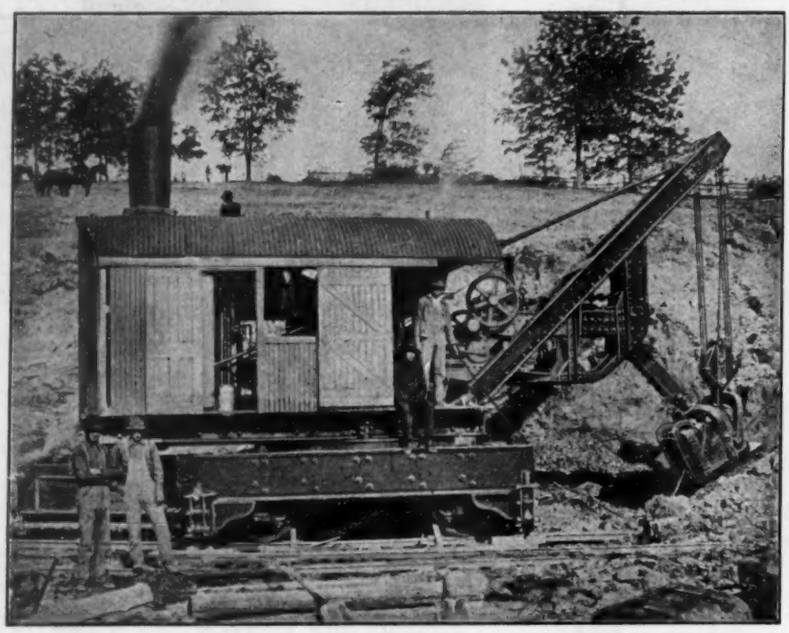

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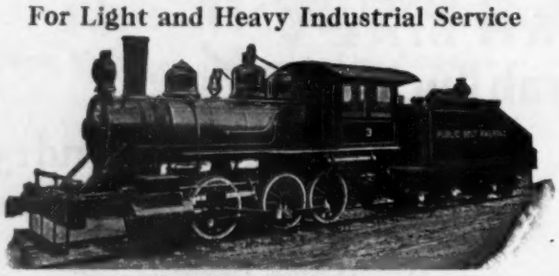

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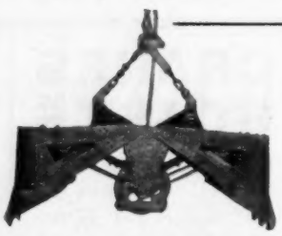

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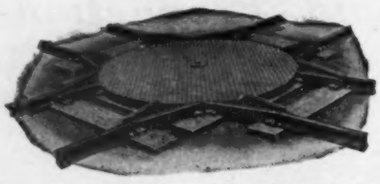

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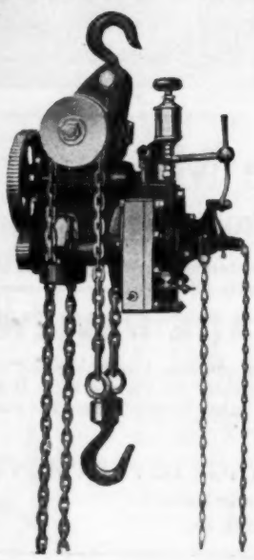

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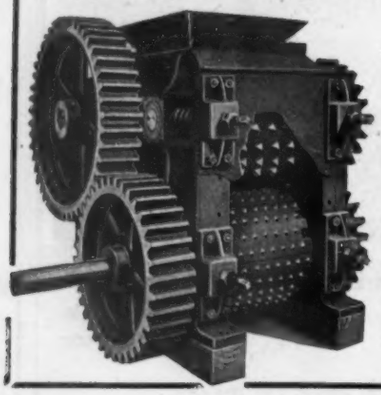

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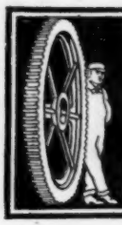

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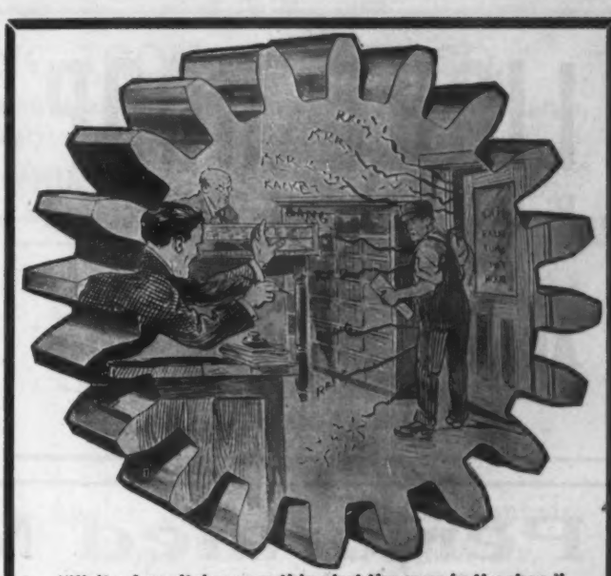

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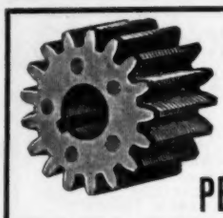

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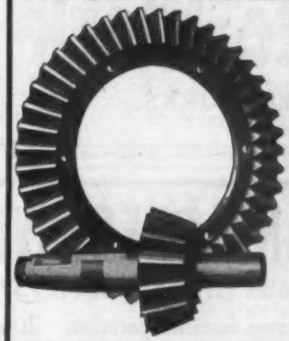

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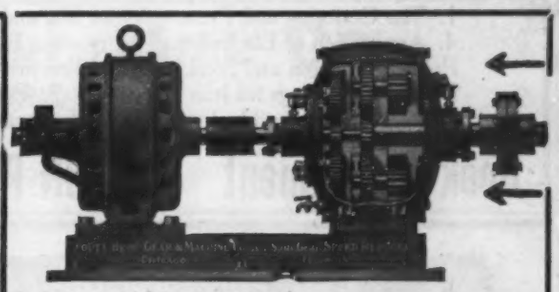

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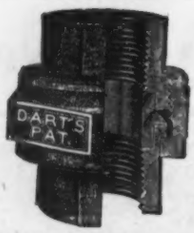

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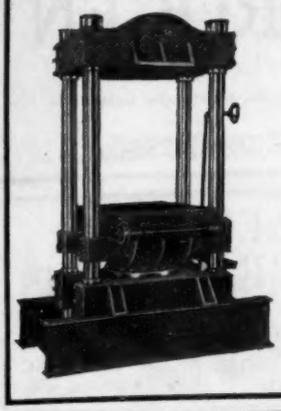

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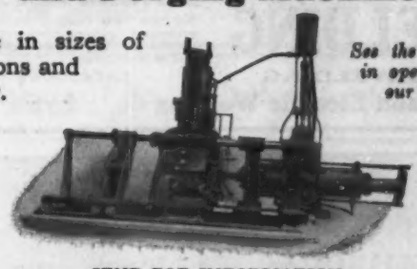

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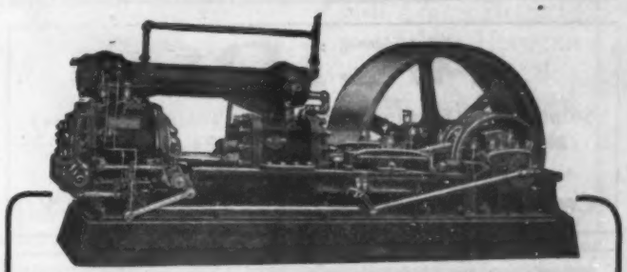

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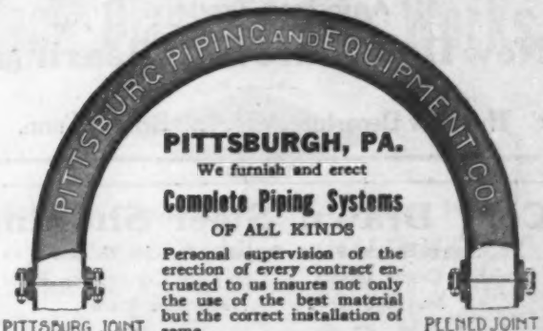

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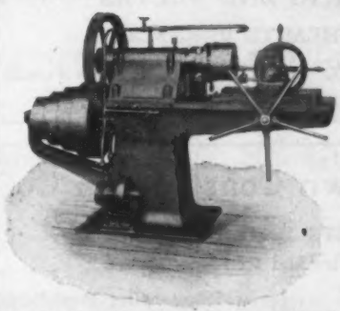

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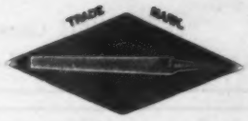

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consisting of one blast furnace stack 16x70, three fire brick stoves 18x60 with draft stack, two Cuyahaga blowing engines, three Cahall vertical and two horizontal tubular boilers, four pumps, two draft stacks, two locomotive engines 3 foot gauge, and all buildings, viz.: Stock house with trestles, brick hoisting tower, cast house, engine house and shops. Railroad connection from N. Y. O. & W. Railway to plant.

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24" Gould & Eberhardt Crank Shaper.
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24" x 20" x 6' New Haven Planer.
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3000 tons 56lb. Relaying Rails
1000 " 60lb. " "
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And lighter rails.
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10 CINDER LADLES

5 Pollock Hand Dump and 5 Weimer Automatic. All 200 cubic feet capacity.
In No. 1 condition.

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1—50-lb. Bradley Upright Helve Hammer.
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1—26" Gisholt Turret Lathe with T'p'r Atd.
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1—30 x 10 American Geared Head.
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1—18 x 12 New Haven.
1—26 x 14 New Haven.
1—24 x 14 New Haven Lathe and T'p'r Atd.
1—21 x 8 Bradford Comp. Rest.
1—18 x 10 Springfield Comp. Rest.
1—18 x 10 Rahn Mayer Comp. Rest.
1—18 x 10 American Comp. Rest, Quick change.
1—16 x 6 Reed with Taper Att.
1—16 x 8 Cincinnati uick C. G.

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1—2" Pratt & Whitney screw machine; tools.
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1—15" Hendey Friction with Tilting Table.
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1—16" Fox Plain Crank.
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CLEVELAND, O.

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COST CLERK—A No. 1 Man, thoroughly competent in establishing cost system and maintaining the same—one having experience in Rolling Mill and Galvanizing Shops preferred. Address with references, and state salary expected. Address Box 370

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Circulation Department
THE IRON TRADE REVIEW
CLEVELAND, OHIO

A Good Position For You may be listed in one of the ads. on this page. Better read them all over and find it. If not—an ad. will let the others know your want.

RATES AND RULES

"Help Wanted" or "Positions Wanted" ads, 2 cents per word (address counts as eight words). No advertisement for less than 50 cents and CASH with order ALWAYS—it saves book-keeping. Do not word your advertisement as you would a telegram. In our experience we find that the quickest results have only been obtained when advertisements have been plainly worded. The saving of a few cents may prove to be the losing of a good position. Send your advertisement before Saturday, Dec. 21st if you want it to appear in December 26th issue.

MAKE IT A POINT every week to read these pages. It is a part of the service you are paying for.

Help Wanted

A FEW GOOD MOLDERS AND CORE makers wanted. Non-union men preferred. Can also use a few experienced chippers. Transportation refunded. Write before coming. Pittsburgh Steel Foundry Co., Pittsburgh, Pa.

CORE MAKER FOREMAN WANTED, by large manufacturing company, making steam and hot water heaters. Must be modern and up-to-date. State age, experience, and salary expected. Address Box 329, THE IRON TRADE REVIEW, Cleveland, O.

CORE ROOM FOREMAN WANTED. By large malleable iron company, located in the east. Good opening for first-class man. Reply, stating salary and experience to Box 355, THE IRON TRADE REVIEW, Cleveland, O.

DEPARTMENT FOREMAN WANTED at once. In up-to-date gray iron jobbing foundry, making medium and light highest grade machinery castings. Molding machines and considerable unskilled help employed. Open shop, life job, with ample opportunity for advancement to the right man. Salary to start, $1,600. The Modern Foundry Co., Oakley (Cincinnati), O.

DRAFTSMAN:—FIRST CLASS DRAFTSman with experience on boiler work, general steel plates and structural steel construction. Permanent position. Address Box 376, THE IRON TRADE REVIEW, Cleveland, O.

DUST ARRESTER FOREMAN WANTed—Steady employment, assured advancement for first-class mechanic; thoroughly experienced in manufacturing and assembling screen type dust arresters. Must be competent to take charge and get results. Give age, nationality, places employed, etc. Correspondence confidential. Address P. O. Box 340, Philadelphia, Pa.

EXPERIENCED FOUNDRY FOREMAN wanted, for steam and hot water heater and stove plate work in large city of central states. Address Box 214, THE IRON TRADE REVIEW, Cleveland, O.

EXPERIENCED LABOR BOSS, wanted, to look after foundry laborers. Must be familiar with the cupola and handling Polish help. State experience and wages expected. Address Box 268, THE IRON TRADE REVIEW, Cleveland, O.

EXPERT OPERATOR STEEL CASTING converter with technical training competent to lay out foundries and design furnaces, annealing ovens, core ovens, etc. State salary expected and give references. Address Box 409, THE IRON TRADE REVIEW, Cleveland, O.

EXPERIENCED MALLEABLE FOUNdry superintendent or foreman wanted, one who can bring 35 to 40 molders and take complete charge of one furnace plant in central west. Have plenty of long running orders and steady work the year around. Address Box 375, THE IRON TRADE REVIEW, Cleveland, O.

EXPERT CLEANING AND CHIPPING room man on automobile motor castings, wanted. Must be a hustler with good executive ability, and know how to handle men to advantage. State experience. Address Campbell, Wyant Foundry Co. Muskegon, Mich.

EXPERIENCED DESIGNERS AND checkers for crane work. State experience in detail, age, and salary expected. in first letter. All replies confidential. Box 389, THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS MAN, ABLE TO TAKE complete charge of converter making small steel castings, must be able to show results, splendid opportunity for the right man. Box 414, THE IRON TRADE REVIEW, Cleveland, O.

Help Wanted

FIRST-CLASS BRASS FOUNDRY FOREman wanted. Must be experienced in melting aluminum, as well as bronze alloys. The right man will have the opportunity of making a profitable connection with a growing concern and may acquire a financial interest in same. Call or write Jamesville Mfg. Co., Jamesville, N. Y.

FOREMAN WANTED FOR SMALL foundry doing both iron and bronze work. Must be competent to direct both these lines and get results. Location New England. Address, stating experience and pay required. Address Box 363, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN FAMILIAR WITH light work and cupola practice, wanted. With experience in malleable iron work preferred. State age, experience and salary. Address Box 211, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN WANTED AT once, experienced on water heater and steam boiler work. Splendid opportunity for a hustler. Must be up to the minute and able to produce quantity and quality. Give full particulars in first letter regarding experience, references, salary and when able to report. Address Box 303, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN WANTED:—FOR a foundry making hot and steam heating apparatus, and job machinery castings. Must be a man familiar with best up-to-date methods and capable of handling molding machines successfully. Must be a man able to handle men. Foundry melting 25 to 30 tons per day, 50 to 75 molders. State age, experience and references, also compensation expected. Address Box 393, THE IRON TRADE REVIEW, Cleveland, O.

IT WILL BE TO THE ADVANTAGE of Louis Windt, enameling expert, to communicate at once with H. M. W., care THE IRON TRADE REVIEW, Cleveland, O.

I WANT A TRAVELING SALESMAN who sufficiently understands foundry practice to demonstrate the actual merits of foundry facing and foundry supplies: Not a mere traveler, nor yet an order taker, but a man of good address and good intelligence, who has had former experience. In replying to this, give full information, whether married or single, where traveled before, age and salary expected. Address Box 359, THE IRON TRADE REVIEW, Cleveland, O.

MOLDER WANTED FOR ORNAMENTAL castings, must be first class. Steady job for right man. Apply by letter giving references. Address Hesse-Martin Iron Works, Portland, Ore.

PATTERN FOREMAN WANTED FOR wood pattern department of steel foundry. For a progressive, up-to-date and wideawake man who can combine accuracy with speed, handle men and is familiar with modern steel foundry practice this position offers good opportunities. State age and full experience. Address Box 245, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT WANTED — HIGH class man for foundry and machine plant. Must be thoroughly conversant with design and construction Single and Four-Valve Automatic Engines, and up-to-date in modern foundry and machine shop practice. State age and experience, together with salary expected. Address Box 386, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT WANTED: — FOR forging plant employing a few hundred men in various departments. State experience in detail, age, salary. Box 408, THE IRON TRADE REVIEW, Cleveland, O.

Help Wanted

SUPERINTENDENT OF STAMPING and enameling plant wanted, one who has had practical experience in making stamped and pieced tinware and can undertake installation of machines. State experience and give references. Address Box 388, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT, FOUNDRY FOREman, and assistant foundry foreman wanted by malleable iron concern. State age, experience and salary wanted. Must be up on molding machines. All replies must be held strictly confidential. Address Malleable, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT WANTED — WE desire to engage an experienced energetic and ambitious superintendent for our stove and range factory and general gray iron foundry. An excellent opportunity for rapid advancement is offered to a really capable man. No "desk superintendent" need apply. We must have a superintendent who can cope successfully with all the troubles with the cupola, troubles with the moldings, troubles everywhere. He must be absolutely fitted to take complete charge of the technical end of the business. A man conversant with soil pipe casting preferred. The plant is about to be erected in the Canadian northwest. Write stating full particulars, references and salary expected. Correspondence treated in strict confidence. The Great West Iron, Wood & Chemical Works, Ltd., Prince Albert, Saskatchewan, Canada.

TWO EXPERIENCED OPEN HEARTH first helpers wanted. Address Alloy Steel Casting Co., Wheeling, W. Va.

TWO FIRST CLASS PATTERNMAKERS wanted, for a foundry where all first class patterns are made. Very little skeleton work. State wages. Address XYZ, THE IRON TRADE REVIEW, Cleveland, O.

WANTED A GOOD LIVE SOLICITOR for gray iron and malleable iron castings. Address Box 340, THE IRON TRADE REVIEW, Cleveland, O.

WANTED A GOOD COMPETENT foundry foreman for a gray iron foundry. Must thoroughly understand bench and floor as well as machine molding. A good chance for advancement for the night man. Address giving age, reference, experience and salary expected. Address Box 297, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — FIRST CLASS BRASS molder in small, strictly up-to-date foundry in Southern California. Hawley-Schwartz furnaces. Must be experienced in light jobbing work and electrical fixture work. Good job for the right man. Address Baker Machine Co., San Diego, Cal.

WANTED FOREMAN FOR A LARGE brass foundry. Must be thoroughly up-to-date in the mixture and treatment of metals, complicated core work, and all detail relating to the manufacture of red and yellow brass and bronze. Give full report of employment up to present time, and state salary expected. Address E. L., Post Office Box 1688, New York City.

WANTED:—ORNAMENTAL IRON AND bronze molders, steady job and good wages for competent men. Apply Flour City Ornamental Iron Works, Minneapolis, Minn.

WANTED: — IRON AND STEEL ACcounts for Detroit and state of Michigan. Address Box 394, THE IRON TRADE RE-

WANTED:—A MAN EXPERIENCED IN enameling bath tubs and sinks and able to handle men. Communicate at once with C. A. W., care THE IRON TRADE REVIEW, Cleveland, O.

CLASSIFIED liner advertisements are helping firms all over the country to find competent men for responsible positions. The surest and most economical way to secure a reliable man is through the "HELP WANTED" department of THE IRON TRADE REVIEW.

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Do not word your advertisement as you would a telegram. In our experience we find that the quickest results have only been obtained when advertisements have been plainly worded. This will save you time and unnecessary correspondence. Send your letter before Saturday, Dec. 21st, if you want to get in Dec. 26th issue.

The United Metal Trades Association

SEATTLE, WASH.

"We are glad to say that the first insertion of advertisement we placed in your paper brought results."

Positions Wanted

AS FOREMAN IN GRAY IRON FOUNDRY, by practical experienced foreman, on light or heavy work. Jobbing work of all kinds. Twelve years as foreman. Mix by analysis, of strictly temperate habits. Best references. Address Box 328, THE IRON TRADE REVIEW, Cleveland, O.

AS FOREMAN, POSITION WANTED, by a practical molder of 14 years experience on steam and gas engines, light and heavy machinery castings. Expert on jarring and stripping plate machines. Graduate of McLain's system of making mixtures, cupola practice and semi-steel. Twenty-eight years of age. Married. Strictly temperate. Hustler. Address Box 356, THE IRON TRADE REVIEW, Cleveland, O.

AS FOREMAN POSITION WANTED by one who has filled position with the largest steel companies in Pennsylvania. Can produce a high grade plate, handle men entirely satisfactory together with cupola practice. Temperate and of middle age. Will be free to accept position Jan. 1, 1913. Address H. O. C., THE IRON TRADE REVIEW, Cleveland, O.

AS FOUNDRY SUPERINTENDENT OR general foreman, who is now in charge of one of the largest plants in the country. Making gray iron, malleable iron and crucible steel. Up-to-date in all details of foundry practice. Resourceful and can show results; at present position which I hold now for several years. Address Box 310 THE IRON TRADE REVIEW, Cleveland, O.

A PRACTICAL FOUNDRY FOREMAN, eight years' experience in that capacity on jobbing work, floor and bench, heavy and light castings. Sober and reliable. Desires position in central west. Address Box 299, THE IRON TRADE REVIEW, Cleveland, O.

A RELIABLE AND ENERGETIC PATtern foreman of wide experience desires to make a change. References. Address Box 336, THE IRON TRADE REVIEW, Cleveland, O.

AS SUPERINTENDENT OR GENERAL foreman of a malleable iron or gray iron plant. Up-to-date in mixing of iron in cupola and air furnace practice. Also capable of constructing and organizing an up-to-date foundry in all details. Am at present in charge of a plant employing 250 molders, both malleable and gray iron. Address Box 311, THE IRON TRADE REVIEW, Cleveland, O.

AS SUPERINTENDENT OR FOREMAN of foundry position wanted. Have had 7 years experience handling men, age 38 years. Strictly sober; at present employed as foreman. Can furnish reference from past employers. Michigan or middle west preferred. Address Box 333, IRON TRADE REVIEW, Cleveland, O.

AS SUPERINTENDENT OR FOREMAN, position wanted, by an all around practical man of many years experience. Address Box 250, THE IRON TRADE REVIEW, Cleveland, O.

A POSITION AS SUPERINTENDENT in a foundry making auto cycle, by a man who is up-to-date in that line having ten years experience, on all kinds of cycles. Using molding machine to make them when possible and up-to-date in general foundry practice, none but a live up-to-date firm need reply. Address Box 254, THE IRON TRADE REVIEW, Cleveland, O.

ACID OPEN HEARTH MELTER DEsires to make a change, good on steel castings, excellent on vanadium and alloy steels. Address Box 372, THE IRON TRADE REVIEW, Cleveland, O.

ASSISTANT FOREMAN POSITION wanted, in shop making steam and hot water boiler, stove plate and hot air heaters. Up-to-date in core work and cupola practice. Address Box 338, THE IRON TRADE REVIEW, Cleveland, O.

ASSISTANT FOUNDRY SUPERINTENdent, to operate between patternshop and foundry. Thorough molding machine knowledge. Good business training, married, strictly sober, a leader. Address Box 239, THE IRON TRADE REVIEW, Cleveland, O.

AS MANAGER OR SUPERINTENDENT of foundry. Practical, thoroughly understands the manufacture of motor castings, having had long experience in those lines as manager and superintendent. Desire a change in the near future. Address Box 335, THE IRON TRADE REVIEW, Cleveland, O.

BRASS FOUNDRY SUPERINTENDENT or foreman position wanted by a man with wide experience in all lines of brass foundry work. Up-to-date on molding machines. Green, dry sand or loam work. Thoroughly understands mixing of metals, handling help, and a hustler. I am now and have been for over eight years superintendent of a large brass foundry doing a general jobbing business. Best of references. Strictly sober. Reliable and married. All inquiries will be held strictly confidential. Address Box 337, THE IRON TRADE REVIEW, Cleveland, O.

CAPABLE FOREMAN TOOL AND DIE maker for excellent position in middle west. Previous record must accompany application. Address Box 320, THE IRON TRADE REVIEW, Cleveland, O.

CHEMIST AND METALLURGIST, TEN years' experience in iron and steel. Expert in cupola practice, chilled and gray iron. Capable analyst in works, materials, paints and oils. Good reason for change. Best of reference. Address Box 327, THE IRON TRADE REVIEW, Cleveland, O.

CORE SUPERINTENDENT OR FOREman. Mr. Foundryman, are you satisfied with the present condition of your coreroom? If not, I would like to talk with you about your core trouble, as I am sure I can reduce your cost, in aluminum, malleable or gray iron, light or heavy. Can furnish best of references from my former employers, also a number of other leading foundrymen. Address Box 358, THE IRON TRADE REVIEW, Cleveland, O.

ENAMELER. HAVE HAD OVER 20 years experience in sanitary enameled ware line and believe I have among other things the finest high grade enamel at lowest cost per pound with A-1 covering properties and the best slush coat, in the business. Will make engagement for agreed length of time, furnish recipes, data and any information I may have as a result of the above years of practical work. Correspondence solicited for particulars. Address Box 270, THE IRON TRADE REVIEW, Cleveland, O.

EXPERT FOUNDRYMAN. AGE 34; 18 years practical experience on malleable, light or medium gray iron castings. Agricultural work, etc., 6 years as expert and foreman, handling up to 6,150 men, at present employed, desires to hear from reliable firm in need of such a man. United States or Canada. Best references from past employers. Address Box 361, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN IN A STOVE PATTERN shop, position wanted. Can handle both wood and iron shops, draughting, designing and foundry practice; up-to-date. Address Box 298, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN IN GRAY IRON foundry employing 15 to 25 molders, doing heavy and general jobbing work. Open shop in Michigan or Ohio preferred. Can get best results from cupola, and men. Ten years as foreman on such class of work. Address Box 364, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN POSITION WANTed, in malleable or gray iron foundry. Up-to-date in foundry practice, 29 years' experience; married, strictly temperate, experienced on molding machines, open shop preferred. Address Box 334, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN, POSITION wanted. I can make a success of any foundry that is in need of a man that can handle heavy and light jobbing and machinery castings. At present foreman of a large foundry doing high class castings and employing about 150 men. Address Box 265, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN, POSITION wanted. Or assistant in bench shop, well up on molding machines and a hustler. Address Box 197, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN POSITION wanted, large experience on loam, dry or green sand, engines, pumps and general jobbing of any size, first class on cupola practice, jar machines, drawings, good executive 14 years with last company. Can furnish first-class references. Address Box 332, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY MANAGER, OR SUPERINtendent. Practical foundryman 35. Technical education. Resourceful, energetic, good executive ability. Capable of taking entire charge of foundry business, both office and shop. Mixing metals by analysis method. Producing best grade gray iron and semi-steel castings. At present employed as superintendent. Address Box 263, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN WITH TEN years' experience as foreman on castings, green or dry sand, desires to make a change. Age 39 years, married and good habits. Can give good reference. Address Box 407, THE IRON TRADE REVIEW, Cleveland, O.

GRAY IRON FOUNDRY FOREMAN UP-to-date, desires to correspond with some good firm who is in need of a man of this kind. Open for a position at an early date. Address Box 347, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

IS THERE AN UP-TO DATE FOUNDRY concern who would like to communicate with a live man 34 years old? At present employed as assistant foreman, who eats, drinks and talks molding machines and won't get indigestion. A-1 references. Address J. O. B., THE IRON TRADE REVIEW, Cleveland, O.

MANAGER OR SUPERINTENDENCY—By a young man of ability and extensive experience. Desire to connect with a manufacturing concern having foundries, etc., and employing from 300 to 600 men. One who knows materials as well as men. If you have a hard nut to crack, let me try it. Good will of present and past employers. Address "Resourceful," THE IRON TRADE REVIEW, Cleveland, O.

METALLURGIST AND CHEMIST—EXtensive experience, gray iron, malleable iron and brass foundry work. Cupola, air furnace, open hearth, crucible and oil melting furnaces. Experienced in the use of pyrometers of various makes and types. Specialty, malleable iron by any process of melting or annealing. Sufficient managing and executive experience to take a position of considerable responsibility. At present employed, but desire renumeration more reconcilable with my ability. Address Box 330, THE IRON TRADE REVIEW, Cleveland, O.

MR. FOUNDRYMAN:—IS YOUR FOUNdry supervision as you would want it for the coming wave of prosperity; or, is it running haphazard? If you feel you need a competent man at the helm to take care of your interest, give me an opportunity to show you that I am competent. Fifteen years' experience in foundry management, thorough knowledge of the mixing of irons and cupola practice, and excellent ability for handling men, also a No. 1 reference is what I have to offer you. Am competent to take charge of car wheel or grey iron foundry. Address Box 331, THE IRON TRADE REVIEW, Cleveland, O.

MANUFACTURERS' REPRESENTATIVE who is responsible and produces results, desires to handle one or two more good accounts on a commission basis, in Cleveland and vicinity. Address Box 390, THE IRON TRADE REVIEW, Cleveland, O.

PARTY IS IN TOUCH WITH A PRACtical steel and iron foundryman. Fifteen years with one concern as superintendent. Any parties looking for a superintendent, will place them in touch with above party for their investigation. Correspondence held strictly confidential. Address Box 357, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS SUPERINtendent in stove foundry understand all kinds of stove construction from patterns to foundry. Also economical foundry practice. Address Box 142, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

PRACTICAL MALLEABLE FOUNDRYman desires position as superintendent or general foreman. Thoroughly competent and up-to-date on all grade malleable castings, foundry equipment, molding machines, melting and annealing. Good executive, can produce castings of best quality at low cost. Address Box 339, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL MANAGER OR SUPERINtendent of malleable foundry. Thoroughly competent and up-to-date on all high grade malleable castings. Foundry equipment, molding machines, melting and annealing. Good executive. Can produce castings of best quality at low cost. Address Box 238, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS MANAGER OR superintendent of steel foundry, by a man who is qualified to take full charge. Am practical in open-hearth converter and crucible steel and all other details of the business. Can produce any grade of steel casting required and am expert on high grade manganese steel. Have 20 years' experience on all grades of work, know the trade and its requirements from coast to coast, have managed successfully some of the largest plants in the country, and have proven ability and can give best of reference. Address Box 405, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL COREMAKER WITH 22 years experience on all kinds of core work, including core sand, molding, such as brands, discs, air cooled cylinders. Would like to work in small gray iron foundry doing such work. Willing to invest. Address Box 346, THE IRON TRADE REVIEW, Cleveland, O.

RELIABLE MARRIED MAN, POSITION wanted, as foundry foreman in gray iron foundry. Good habits. Energetic, up-to-date on jobbing work, dry and green sand, engine, core work. A hustler. References. Address Box 354, THE IRON TRADE REVIEW, Cleveland, O.

SALES MANAGER: — A TECHNICAL graduate with demonstrated executive ability and fifteen years successful sales experience wants position as sales manager or sales engineer. Address Box 373, THE IRON TRADE REVIEW, Cleveland, O.

SALES ENGINEER EXPERIENCED AS works manager. Chief engineer in large works desires to form connections with up-to-date company who would consider extending their lines of manufacture. Address Box 305, THE IRON TRADE REVIEW, Cleveland, O.

SITUATION WANTED: — FOUNDRY superintendent or general foreman. Thoroughly competent both as manager and mechanic. Extensive experience with molding machines, expert in mixtures of gray iron, semi-steel, brass and bronze castings in all classes of work, light, medium or heavy and bronze castings. A-1 reference as character and ability. Address Box 213, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

STEEL FOUNDRY SUPERINTENDENT of wide experience in both heavy machining and light work desires to make a change. At present employed. Have complete charge of a large plant producing open-hearth steel castings and have a record for increasing the yield and reducing costs of operations. Position in control of a plant of large capacity preferred, but will consider supervision of a smaller plant provided there is amole opportunity for growth. Address Box 365, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT OF STAMPING and enameling plant, making one coat gray ware, who has had a great deal of practical experience in the manufacture of enamel ware is looking for a like position with reliable concern. Any firm engaged in the manufacture of this line of work who are looking for a result producer should not hesitate in addressing their inquiry to Box 348, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT — FOUNDRY OR patternshop, by a practical molder and patternmaker, at present in charge of patternshop employing 35 men. Also have practical office and drafting room experience. Only high grade position considered. Preferable with motor car concern, can furnish good references. Address Box 362, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT OR FOREMAN OF wide experience in the steel castings process on all class of work, wants position. Best of references. Address Box 360, THE IRON TRADE REVIEW, Cleveland, O.

WOULD LIKE TO CORRESPOND with any one that wants a real foundry foreman superintendent. Address Box 366, THE IRON TRADE REVIEW, Cleveland, O.

YOUNG MAN SEEKS POSITION where there is opportunity to receive a position as traveling salesman calling on the foundry trade. Experienced in foundry practice, also in shipping department. Have selling ability and of good appearance. Can furnish references. Address Box 252, THE IRON TRADE REVIEW, Cleveland, O.

Government Proposals

U. S. Engineer Office, Room 707, Army Building, New York, N. Y., Nov. 21, 1912. Sealed proposals for furnishing structural steel, etc., for Philippine Islands, will be received here until 12 M., Dec. 20, 1912, and then publicly opened. Information on application. S. W. ROESSLER, Col. Engrs.

Just Phone Your "Want" and "For Sale" Ad To
THE IRON TRADE REVIEW

CHICAGO CLEVELAND Local Representatives in NEW YORK PITTSBURGH

In order to continue serving our readers with the same degree of accuracy and promptness as has been our aim in the past—we have decided to simplify the everlasting question of "how to get in touch with reliable men—quickly."

We have offices in the following cities at the addresses given below—and if you desire to place an advertisement in the "Help Wanted" columns of The Iron Trade Review—call up our representatives in your city and they will gladly accept your ad for the next issue.

CHICAGO	1328 MONADNOCK BLDG.	HARRISON 7506
CLEVELAND	PENTON BLDG.	NORTH 1760
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¶ NIAGARA---Tonawanda Iron & Steel Company, North Tonawanda, N. Y.

¶ A strong foundry iron for machinery and high grade castings. Made from Lake Superior ores and coke fuel.

¶ The uniformly high character of Niagara has caused it to be recognized by the United States Government for many years past as a satisfactory brand for Government work and is one of the brands specified by them in the most particular Government requisitions.

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¶ The reason for Niagara's popularity is due primarily to the fact that "Niagara" in all grades has been manufactured from a formula that was thoughtfully and scientifically worked out in connection with a series of experiments which finally produced an ideal iron in each grade and kind. Sold by fracture and analysis grading.

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We represent 50 brands of PIG IRON produced in thirteen different states.

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OUR CHARGING MACHINES

are used in England, Scotland, Wales, Russia, Belgium, France, Germany, Sweden, Spain, India, China, Japan, Mexico, Canada, and throughout the **United States of America.**

MORE THAN 175 IN OPERATION

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Any special sheet metal goods or parts that it would not pay you to make in your own plant, we can make to your order. Our facilities and experience enable us to make them just as you specify and at a price that will pay you to have us make them.

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are insured by a modern up-to-date plant with a floor space of 12 acres filled with time and labor saving equipment and machines and manned by an experienced and skilled organization that is keenly alive to your interests and wants. Let us figure with you and point out a saving.

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Electric Locomotives, Storage Battery Trucks, *for every need*

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that every large auto body manufacturer in the country can complete factory orders promptly by using our special stock, ordered expressly for this work—the only stock of Patent Levelled Sheets especially designed for this purpose?

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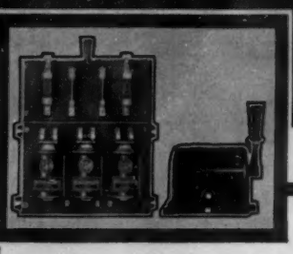
E.C.&M. AUTOMATIC CONTROLLERS for MOTOR-DRIVEN MACHINES



Permit of starting most machines from rest, without the use of a clutch.

Thus the Motor can be stopped for short intervals and restarted in the minimum time.

A Motor running idle, consumes 15% of full load current.

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Keep in Touch With Us

If you are engaged in iron and steel construction of any sort, or are planning for the immediate future, it will pay you to keep in touch with us.

Our extensive warehouse facilities enable us to make immediate shipment of practically everything in iron and steel, saving you the expense, uncertainty and long delay due to the present congestion of orders at the mills.

Immediate Shipment

Keep the Bourne-Fuller Stock List handy. In it you will probably find the very sizes of which you are in need. We ship from warehouse stock on the day we get your order.

See our advertisement on page 7.

THE BOURNE-FULLER CO

Iron, Steel
Pig-Iron
Coke

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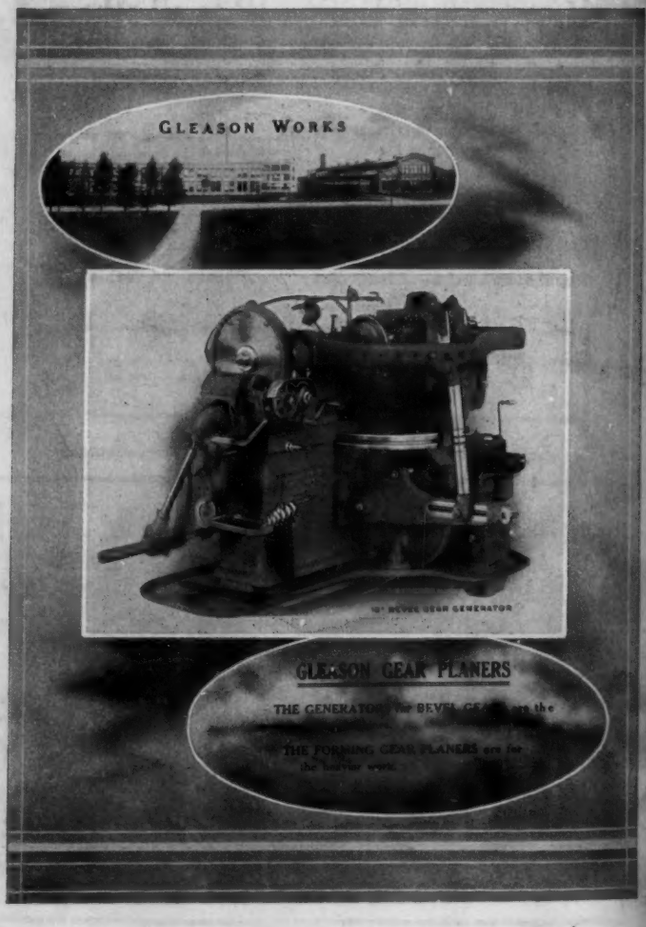
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